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AVIATION

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Regulating AMERICA'S AIR COMMERCE

FORECASTING *Aircraft Demand*

AVIATION PROGRESS IN *Soviet Russia*

IN TWO SECTIONS
Section One

AVIATION January 25, 1930 Vol 28 No ... New York, N. Y.

MANUFACTURERS' SPECIFICATIONS ON AMERICAN C

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT *AVIATIO*

This table will appear monthly and

MANUFACTURER	Designation	Price of Plane at Factory	Type	No. of Seats	Make of Engine	Total Rate HP	Make of Propeller	Span	Wing Area (Sq Ft)	Length Overall	Height Overall	Weight Empty (Lb) With Water If Water Cooled Engine is Used	Pay Load (Lb)	Disposable Load (Lb)	Normal Gross Weight Loaded (Lb)	Wing Loading (Lb per Sq Ft)	Power Loading (Lb per Hp)
Alexander Aircraft Corp	Eaglerock A-4		OBL	3	J-5	200		36' 8"	330	24'11"	9'11"				2 491	7 54	12 4
Alexander Aircraft Corp	Eaglerock A-2	$2 000	OBL	3	OX-5	90		36' 8"	330	24'11"	9'11"				2,442	7 40	27 1
Alexander Aircraft Co	Eaglerock A-12	3 247	OBL	3	Co	150	M	36' 8"	330	24' 2½"	9'10"	1 685	340	892	2 582	7 94	17 2
Alexander Aircraft Co	Eaglerock A-15	3 307	OBL	3	K	100	W	36' 8"	300	25'11¼"	9'10"	1 539		917	2 456	7 45	24 5
Alliance Aircraft Corp	Argo	4 500	OBL	2	Wr	113	SS	28' 0"	203	20' 2"	9' 1"	1 077	200	538	1 613	7 95	14 0
American Eagle Aircraft Co.	Threeplane	5 795	CML	3	K	101	SS	37'	219	24'	6'	1 320	425	780	2 100	9 90	21 2
American Eagle Aircraft Co.	Al-29	4 895	OBL	3	K	120	Ha	30'	305	24' 6"	8'7½"	1 220	340	800	2 020	6 60	18 3
American Eagle Aircraft Co	A-1	3 195	OBL	3	OX-5	90	H Ha	30'	300	25' 1"	8' 4"	1 402	340	800	2 216	7 40	24 5
Arrow Aircraft & Motors Corp	A 2-K 100	4 565	OBL	2	K	100	Ha	25' 10"	183	19' 6"	8' 4"	1 004	220	546	1 530	8 5	15 5
Arrow Aircraft & Motors Corp	A-2 L-60	3 485	OBL	2	LB	60	Ha	25' 10"	183	19' 3"	7' 5"	900	170	446	1 346	7 35	19 5
Bach Aircraft Co	3-CT-8	39 500	CML	10	Pw B 2-J6 5	855	SS	58' 3"	491	36'10"	10'	4 785	1,570	3,215	8,000	14 00	8 93
Bach Aircraft Co	3-CT-9	39 500	CML	10	PWw 2-J6-7	875	SS	58' 6"	421	36'10"	9' 9"	4 830	1 525	3 170	8,000	14 00	9 14
Bellanca Aircraft Corp	Pacemaker	14 750	CML	6	J-6	300	M	46' 4"	273	27' 9"	8' 4"	2 275	1 060	2 025	4 300	15 74	14 5
Bellanca Aircraft Corp	CH 300 Seaplane	18,000	CMW	6	J-6	300	M	46' 4"	273	30' 5"		2 810	1 060	2 025	4,835	17 1	16 1
Bellanca Aircraft Corp	Freighter		CML	4	J-6	300	M	46' 4"	273	27' 9"	8' 4"	2 290	1 370	2 310	4,600	16 82	13 3
Bird Wing Commer Airplane Co	No 6	2 793	OBL	3	HX-5	90	Ha	31' 4"	305	25' 6"	8' 7"	1 236	550	1 019	2,255	7 44	25 0
Boeing Airplane Co	40-B	24 500	SBL	3	P Wh	325	H M	44' 4"	545	33' 4"	11' 8"	3 543	1 436	2,536	6 079	11.15	15 1
Boeing Airplane Co	40-C	22 500	SBL	5	P Ww	400	H M	44' 4"	545	33' 4"	11' 8"	3 522	1 433	2,533	6 075	11 14	12 1
Boeing Airplane Co	204	20 000	CBF	5	P Ww	400	H	39' 8"	470	32' 6"	12'	3 358	913	1 642	5 000	10 62	12 2
Boeing Airplane Co	80-A	75 000	CBL	18 +	3 Pwh	1 575	H M	80'	1 250	55'	15' 2"	10 413	3 870	7 087	17 500	14 00	11 6
Boeing Airplane Co	95	24 500	OBL	1	Pwh	325	H M	44' 3"	490	31'11"	12' 1"	3 196	1 600	2 644	3 840	11 00	11 1
Breese Aircraft Co			CML	6	J-5	200	SS	41'	260	27'	10' 6"	135		1,000	2 550	9 80	12 7
Brunner Winkle Aircraft Corp	Bird Model A		OBL	3	OX-5	90	W	34'	266	23' 8"	8'	1 300	400	850	2,150	8 10	24 0
Brunner Winkle Aircraft Corp	Bird Model B		OBL	3	K	90	SS	34'	266	23' 8"	8'	1,100	800	800	1,990	7 50	22 0
Buhl Aircraft Co	CA-6	13,500	CQL	6	J-6	300	SS	40'	305	29' 8"	8' 7"	2 478	1,192	2 022	4 500	14 75	15 0
Buhl Aircraft Co	CA-8-A	19 500	CQL	8	Cy	525	SS	48'	462	56'	10'	3 54[illegible]	1 590	2 758	6 300	15 62	12 0
Buhl Aircraft Co	CA-8B	19 500	CQL	8	1 Wh	525	SS	48'	462	56'	10'	3 54[illegible]	1 590	2 758	6 500	15 62	12 0
Buhl Aircraft Co	CA-3C	11 000	CQL	3	J-5	225	SS	36'	240	28'	8'	1 760	690	1 440	5 200	15 3	14 2
Buhl Aircraft Co	CA 3D	12 000	CQL	3	J-6	300	SS	36'	240	28'	8'	2,017	415	1,183	5 200	15 3	10 6
Cessna Aircraft Corp	DC-6	9 200	CML	4	R-600	170	SS	40' 8"	268	27'11"	7' 8"	1,767	610	1 221	2 988	11 3	17 6
Cessna Aircraft Corp	DC 6 A	11 500	CML	4	J-6	300	SS	40' 8"	268	27'11"	7' 8"	1 932	610	1 248	3 180	11 87	10 6
Cessna Aircraft Corp	DC 6 B	10 000	CML	4	J 6	275	SS	40' 8"	268	27'11"	7' 8"	1 879	610	1 229	3 100	11 57	13 7
Cessna Aircraft Corp	CW-6	14 500	CML	6	J-6	300	SS	45' 4"	296	29' 4"	8' 2"	2 175	1 056	1 775	3 950	13 70	13 2
Cessna Aircraft Corp	CPW-6	18,000	CML	6	PWw	400	SS	45' 4"	29[illegible]	30'	8' 2"	2 425	1 113	1 825	4 250	14 30	10 0
Chance Vought Corp	Corsair		OBL	2	PWw	425	SS H		320	24' 7"	10' 2"	2 300		1 200	3 500		
Chance Vought Corp	Corsair Seaplane		OBW	2	PWw	425	SS H		320	28' 6"	11' 4"	2 600		900	3 500		
Command Aire Inc	3 C-3	7 200	OBL	3	R-600	170	SS	32' 6"	305	24' 6"	8' 4"	1,445	310	405	2 563	7 7	14 2
Command-Aire Inc	3-C-3-A	5 600	OBL	3	W	110	W H	32' 6"	305	24' 6"	8' 4"	1,200	560	305	2,145	7 0	19 5
Command-Aire Inc	3-C 3-C	7 000	OBL	3	J-6	165	SS	32' 6"	305	24' 6"	8' 4"	1 400	310	440	2 350	7 7	14 2
Command-Aire	3-C 3-B	6 025	OBL	3	Ax	150	H	32' 6"	303	24' 6"	8' 4"	1,458	510	405	2 373	7 8	15 8
Crown Motor Carriage Co, Inc	Custombuilt B 3	4 975	OBL	2	K	100	Sty H	28'	236	21' 6"	8' 6"	1,242			1,756	7 62	17 5
Cunningham-Hall Aircraft Corp	PT-6	13 900	CBL	6	J-6	300	SS	41' 8"	370	29' 8"	9'11"	2 680	910	1,620	3 450	11 70	15 5
Curtiss-Robertson A p le Mfg Co	Robin OX-5	4 000	CML	3	OX 5	90	Ha	41'	245	25' 5"	7' 10"	1 489	328	728	2,271	8 94	24 1
Curtiss-Robertson A p le Mfg Co	Robin R-600	7 300	CML	3	R-600	170	CR	41'	245	25' 1"	8'	1,700	454	962	2 600	10 20	15 2
Curtiss-Robertson A p le Mfg Co	Robin-J	7 500	CML	3	J-6	165	SS	41'	243	25' 6"	8'	1,615	390	898	2 513	10 40	14 8
Curtiss-Robertson A p le Mfg Co	Thrush-J		CML	6	J-6	225	CR	48'	305	32' 4"	9' 3"	2 266		1 540	3,300	12 4	17 0
Davis Aircraft Corp	D-1	2,965	OML	2	LB	60	Ha	30' 6"	145	19' 8"	7'	816	350	500	1,300	8 96	21 6
Davis Aircraft Corp	D1-K		OML	2	K	100	Ha	30' 6"	145	19' 8"	7'	920	385	580	1,400	9 6	14 0
Doyle Aero Corp	O-2	2,995	OML	2	LB	65	Ha	30'	165	19'		790		500	1 320	8 8	20 3
Elias G & Bro., Inc	EC-1 Airsport	2,500	OML	2	Elias	80	Elias	28'1½"	192	22'	7' 8"	880		570	1,450	7 55	17 9
Elias, G & Bro, Inc	EC-1 Aircoupe	2 690	CML	2	Elias	80	Elias	28'1½"	192	22'	7' 8"	890		560	1,450	7 35	17 9
Fairchild Airplane Mfg Corp	42	12 300	CML	4	J-6	300	H	45' 6"	290	30' 6"	9' 2"	2,720		1 580	4,300	14 8	14 3
Fairchild Airplane Mfg Corp	71	18 300	CML	7	PWw	420	SS	50'	309 6	32'10½"	9' 4"	3 1[illegible]0		2 570	5 500	16 34	13 7
Fairchild Airplane Mfg Corp	KR 21	4 665	OBL	2	K	90		27'	193	22' 1"	9'	1 015		533	1 550	8 02	17 0
Fairchild Airplane Mfg Corp	KR 31	*2 240	OBL	3	OX-5	90		[illegible]0'	296	23' 9"	9' 4"	1,200		878	2 078	7 00	23 0
Fairchild Airplane Mfg Corp	KR 34	6 373	OBL	3	J-6	165		[illegible]0'	285	25' 3"	9' 3"	1,492		850	2 342	8 40	14 5
Federal Aircraft Corp	CM-1	12 300	CML	5	J-4-B	200	We	37' 6"	262	29' 3"	9'	2 050	630	1,595	3,475	13 26	17 8
Fleet Aircraft Corp	Model I	5 485	OBL	2	W	110	Ha SS	28'	193	21' 1"	8' 9"	1,022	224	558	1 530	8 10	17 5
Fleet Aircraft Inc	Model 2	4 985	OBL	2	K	100	Ha SS	28'	195	20' 9"	8' 9"	1 010	231	565	1 575	8 08	14 5
Fokker Aircraft Corp	Universal	15 000	CML	4	J-6	300	SS	47' 9"	330	35' 6"	8'	2 452	1,180	1 568	4 00[illegible]	13 [illegible]	14 3
Fokker Aircraft Corp	Super Universal	2[illegible] 500	CML	6	P Ww	425	SS	50' 7"	370	36' 7"	8'11"	3 250	1 305	2 2[illegible]	5 5[illegible]0	15 00	15 0
Fokker Aircraft Corp	F 10A	67 500	CML	12	3 PWw	1 275	SS	79' 3"	850	50'	12' 8"	7 780	2 520	5 320	13 100	15 4	10 2
Fokker Aircraft Corp	F 11A	42 000	CML	11	PWh, Cy	525	SS	59'	345	45'10"	13'	4 4[illegible]0	1,295	2,450	6 900	13 4	13 1
Fokker Aircraft Corp	F 14	26 500	CML	6	PWh	525	SS	59'	350	45' 4"	12'11"	4 0[illegible]8	1,600	2 9[illegible]2	7 000	12 75	13 5
Fokker Aircraft Corp	F-32	110 000	CML	32	4 PWh	2 100	SS	99'	1 3[illegible]0	69'10"	16' 6"	14 200		8 300	22 500	16 40	10 7
General Airplane Corp	Aristocrat	7 300	CML	3	W	110	SS	36' 4"	194 5	25' 2"	7' 7"	1 248	365	862	2 100	10 84	19 0
Great Lakes Aircraft Corp	2-T 1 A.	4 990	OBL	2	Cir	90	W	26' 8"	187	20' 4"	8' 5½"	1 002		578	1 580	8 4[illegible]	17 5
Hamilton Metalplane Co	H-45		CML	8	P Ww	400	H	54' 3"	387	34' 8"	9' 4"	3 300	1,455	2,400	5 750	14 3[illegible]	14 5
Hamilton Metalplane Co	H-47		CML	8	P Wh	300	H	54' 3"	387	34' 8"	9' 4"	5 450	1,045	2 301	5 750	14 8	11 0
Heath Airplane Company, Inc	Parasol	975	HML	1	Heath	27	Heath	25'	110	17'	4' 6"	280		300	580	3 3	21 3
International Aircraft Corp	F-17	2 950	OML	3	OX-5	90	H	35'	325	25'	9' 6"	2,480	320	620	2,100	6 49	25 8
International Aircraft Corp	F-18	12 250	OBL	6	J 5	200	SS	57'	360	27' 6"	10' 6"	2 2[illegible]	950	1 5[illegible]	3 750	10 41	18 7
Ireland Aircraft Inc.	N 2 B	22 500	CBA	5	J-6	300	SS	40'	380	31'	12' 2"	2 940	790	1 468	4 400	11 60	14 5
Ireland Aircraft, Inc	Neptune N 2-C	27 500	CBA	5	Pww	420	SS	40'	380	31'	12' 2"	3,000	300	1 400	4 400	11 60	10 3
Irwin Aircraft Co.	F-A 1	1,165	OBL	1	Irwin 79	25	Irwin	20'	105	13' 6"	5' 9"	275	75	300	500	5 00	20 0
Keystone Loening Aircraft Corp	Air Yacht		CBA	8	Cy or PWh	525	SS	46' 8"	547	34' 9"	13' 2"	3 895	1,100	2 355	6,250	11 4	11 3

COMMERCIAL AIRPLANES AS COMPILED BY *AVIATION*

AVIATION DOES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN

Corrections and suggestions are invited

Performance with Full Load at Sea Level as Supplied by Manufacturers: High Speed in M.P.H.	Cruising Speed in M.P.H.	Landing Speed in M.P.H.	Climb at Sea Level in F.P.M.	Climb to 10,000 ft. in Minutes	Service Ceiling in Feet	Fuel Capacity in Gal.	Normal Range in Miles	Normal Fuel Consumption Gal. per Hr.	Fuselage Construction	Wing Construction	Air Wheels Used for Landing	Type of Control	Brakes	Type of Shock Absorber	Dept. of Commerce Type Certificate Number	Performance Figures Guaranteed	
130	87	39	1 000		17 000	40	455	10 3	BI-ST	Wd-F		SCD		RC	57	Yes	Alexander—Eaglerock A-1
100	87	34	1,000		10,000	30	500	5	BI-ST	Wd-F		SD		RC	58		Alexander—Eaglerock A-2
116	105	40	1,250	30	16 000	50	300	9 2	BI-ST	Wd-F	Yes	SCD	Ex	RC	129		Alexander—Eaglerock A-12
125	100	40	1,058	25	16 000	35	370		BI-ST	Wd-F	Yes	SCD	Ex	RC	178		Alexander—Eaglerock A-13
112	95	30	1 000	8	14 600	35	800	6 4	BI-ST	Wd-F	Yes	SPD	No	RC	128		Alexander Argo
100	95	30	900		14 000	22	500		BI-ST	Wd-F	Yes	SPD	No	RAR	134		Wallace—Touroplane Model "B"
99	85	30	750		12 000	22	600		BI-ST	Wd-F	Yes	SPD	No	RC	174		American Eagle—A1-29
95	80	35	1,000		14,000	20	600		BI-ST	Wd-F	Yes	SD	No	RC	29		Arrow—A 2-B-100
100	90	35	800		12 000	16			BI-ST	Wd-F		SD		RC	115		Arrow—A 2-60
152	135	60	1,180	10	15 500	200	525	42	BI-P	Wd-F	Yes	DeC	B	HY-C	172		Bach 3—CT-3
150	125	60	1,380	10	20,000	200	525	42	BI-P	Wd-F	Yes	DeC	B	HY-C	221		Bach—CT-9
145	110	40	1,000		16,500	122	900	16	BI-ST	Wd-F	Yes	SCD		RC	129		Bellanca—Pacemaker
132	110	40	1,250		18,000	122	900	16	BI-ST	Wd-F	Yes	SCD		RC	130		Bellanca—CH-300—Seaplane
130	80	40	1,050		15 000	22	425	10	BI-ST	Wd-F	Yes	SCD		RC			Bellanca—Freighter
100	80	40	620		14 500	125	400		BI-ST	Wd-F		SCPD	Yes	Apl			Bird Wing—Type A
140		52	900	16 5	5 100	140		25	BI-ST	Wd-F	Yes	S					Boeing—40-B
135		50	1 000	15 5	15 600	140		25	BI-ST	Wd-F	Yes	S					Boeing—Model 100
128		55	500	20	14 000	155	400		BI-ST	Wd-F		SD			157		Boeing—Model 80-A
155		59	1,000		15 500	44	500	42	BI-ST	Wd-F	Yes	D			75		Boeing—Model 95
145		50	900		16 000				BI-ST-D	Wd-F							Boeing
100	115	45	900		15,500	35	550	9 5	BI-ST	Wd-F	Yes	SPD	No	OR	161		Brunner Winkle Bird model A
110	100	40	700	25	15,000	45	500	11	BI-ST	Wd-F	Yes	SPD	No	OR	239		Brunner Winkle Bird model B
140	115	45	1,200		15 000	50	220	16	BI-ST	Wd-F	Yes	SD	B	RC	39		Buhl—CA-6
145	125	40	1 200		19 000	75	725	18	BI-ST	Wd-F	Yes	SD	B	RC	95		Buhl—CA-8
135	110	45	1 000		16 000	75	725	14	BI-ST	Wd-F	Yes	SD	B	RC	95		Buhl—CA-3-C
150	125	45	1 200		16 000	70	700	16	BI-ST	Wd-F	Yes	SD	B	RC	163		Buhl—CA-3-D
130	105	45	800	16	15 000	60	500		BI-ST	Wd-F	Yes	SPD	B	HY	202		Cessna—DC-6
150	130	47	1 200	13	18 000	60	500		BI-ST	Wd-F	Yes	SPD	B	HY	241		Cessna—DC-6-A
120	100	47	600	23	12,500	60	500		BI-ST	Wd-F	Yes	SPD	B	HY	242		Cessna—DC-6-B
110	95	35	1,000	10	18,000	60	500		BI-ST	Wd-F	Yes	SPD	B	HY	Apl		Cessna
155	125	48	2,030	10	22 000	110	420	20	BI-ST	Wd-F	Yes	S					Vought Corsair landplane
145	120	58	1,800	12	20 000	110	420	20	BI-ST	Wd-F	Yes	S					Vought Corsair seaplane
115	95	30	850		14,000	35	400	7 5	BI-ST	Wd-F	Yes	SD	No	RC	146		Command-Aire 3-C-3
115	95	35	900		16,000	35	400	7 5	BI-ST	Wd-F	Yes	SD	No	RC	212		Command-Aire 3-C-3-A
120	90	35	1,000		15,000	35	450	7 5	BI-ST	Wd-F	Yes	SD	No	RC	234		Command-Aire 5-C-3
105	80	40	600		12,500	35	440		BI-ST	Wd-F		SD	No	RC	272		Command-Aire 5-C-3
145	100	45	1,000	33	16,000	100			BI-Mon	Wd-F	Yes	SCD-Pl	No	Grs	199		Curtiss Fledgling
115	90	45	1 000		11 250	50	730		BI-PC	Wd-F	Yes	SPC	No	RC	63		Curtiss Condor
130	105	45	1 000	13	12 700	50	500		BI-ST	Wd-F	Yes	SPC	B	RC	68		Curtiss Robin C
120	101	45	840	17	10 000	50	534		BI-ST	Wd-F	Yes	SPC	B	RC	89		Curtiss Robin J
120	101	45	1,000						BI-ST	Wd-F		DCP-Pl		RC			Curtiss—Thrush J-6
110	95	30	1,000	20	12 000	25	450	4 5	BI-ST	Wd-FD	Yes	DSPC	No	RC	256		Davis—D-1
128	105	40			12 000	25	415		BI-ST	Wd-F	Yes	DSPC	No	RC	257		Dewoitine—D-1 K
120	95	41				25	625	5	BI-ST	Wd-F		SPCD		RAR	207		Driggs—Dart
110	96	30	500		10 000	25	500	3	BI-ST	Wd-F	Yes	SCD	Sily	Ip	141		Elias—Aircoupe—EC-1
100	90	35	540		10 500	25	450	3	BI-ST	Wd-F	Yes	SCD	Sily	Ip	142		Elias—Aircoupe—EC-1
130	100	38	1,000		15 500	50	630		BI-ST	Wd-F	Yes	SPD		Q	242		Fairchild—42
135	110	63	850		15 300	40	650		BI-ST	Wd-F	Yes	SPD		Q	88		Fairchild—71
102	90	42	725		12 000	25	300		BI-ST	Wd-F	Yes	SPD	No	RD	115		Fairchild—KR-21
110	91	40	549		11 600	25	400		BI-ST	Wd-F	Yes	SPD	No	RC	189		Fairchild—KR-31
115	105	47	800		14,500	30	400		BI-ST	Wd-F	Yes	SPD	No	RC	162		Fairchild—KR-34
135	105	40	620			30	750	10	BI-ST	Wd-F	Yes	SC	Yes	Aprl			Federal Aircraft—CM-1
113	85	42	820		15,000	24	310	5	BI-ST	Wd-F	Yes	SPD	No	RAR	122	Yes	Fleet—Model 1
118	98	42	820		15 000	24	325		BI-ST	Wd-F	Yes	SPD	No	RAR	164		Fleet—Model 2
140	118	51	800		14 000	120	450	26	BI-ST	Wd-F	Yes	SPD	No	RAR	41		Fokker—Super Universal
138	115	50	1,000		14 000	120	450	26	BI-ST	Wd-F	Yes	DrD	Yes	RAR	222		Fokker—Super Universal
130	110	55	1 000		14 000	170	425	26	BI-ST	Wd-F	Yes	DrD	Yes	RAR	222		Fokker—F-10-A
150	123	60	1 000	13	17 000	130	500	26	Wd-ST	Wd-F	Yes	DeD	Yes	Grs	Apl		Fokker—F-32
110	90	40	600		12,150	40	540		BI-ST	Wd-F		SD	B	RC	112		General—Aristocrat
120	100	40	545		15 000	24	300		Wl-ST	Wd-FD	Yes	SD		Op	123		Great Lakes—Sport Trainer
115	115	50	1 000		16,000	100	500	21	D-cor	D-cor	Yes	Ar	RC	85			Hamilton—H-45
125	110	50	1 000	40	17 000	100	500	21	D-cor	D-cor	Yes	Ar	RC	87			Hamilton—H-47
70	65	32	500		10 500	7	280	2	Wl-ST	Wd-F	Yes	SPD	No	RC			Heath Parasol
103	87	35	800		13 500	40	450	10	Wd	Wd-F	Yes	SD	No	RC	118		International—F-17
110	95	35	800		14 000	40	450	10	Wd	Wd-F	Yes	SD	No	RC	116		International—F-18
90	65	46	550	30	14 000	40	350	15	ST-D	Wd-F	Yes	DrD	No	Ex	156		Ireland—Neptune
110	90	46	650	65	12 000	60	400	15	ST-D	Wd-F	Yes	DrD	No	Ex	114		Ireland Neptune N-2-C
105	80	40	450		10 000	28	250	1 7	Wd	Wd-F	Yes	DeD	No	O			Irwin—F-A1
120	105	55			12,500	140	525	28	Wd D	Wd DF	Yes	DeD		Ari	90 91		Keystone-Loening—Air Yacht

Keystone-Loening Aircraft Corp.	Commuter	14 800	CBA	4	J-6	300 SS	4[illegible]'	4[illegible] 32' 1	1[illegible] 2	2,[illegible]	2[illegible]0	1,230	4 1[illegible]	9 45	13 7
Keystone-Loening Aircraft Corp.	Patrician		CML	20	5 Cy, 3 PWh	1 575 SS	8[illegible]' 6''	994 61' 7''	13' 4	9 555	3 400	6 445	16 000	16 3	9 84
E. M. Laird Airplane Co.	LC-B-200	9 850	OBL	5	J-5	220 H	34' 0''	295 23' 9''	9' 3''	1 800		1,050	2 050	9 6	13 0
E. M. Laird Airplane Co.	LC-B-300	10 850	OBL	5	J-6	300 H	34' 0''	295 23' 9''	9' 3''	1 [illegible]		1,0[illegible]	3,050	10 3	10 0
E. M. Laird Airplane Co.	LC-R-200	10,500	OBL	3	Wright J-5	220 H	28' 0''	202 22' 9''	9' 5''	1,848		1,066	2,914	14 4	15 0
E. M. Laird Airplane Co.	LC-R-300	11 500	OBL	3	Wright J-6	300 H	28' 0''	202 22' 9''	9' 0''	1,922		1 088	3,010	15 3	10 6
Lincoln Aircraft Co.	Lincoln P-3	2 250	OBL	3	OX-5	90 H, Hz Sa	32'	300 23' 10''	8' 6''	1,200	450	1,000	2 200	7 33	24 44
Lincoln Aircraft Co.	Lincoln PT	1 955*	OBL	2	OX-5	90 H, Hz Sa	32' 3''	297 23' 7½''	8' 10''	1 290	393		1 800	2 53	24 44
Lockheed Aircraft Co.	Vega J-6		CML	5	J-6	300 SS	41'	275 27' 6''	8' 6''	2,140	880	1 213	3 355	14 20	15 50
Lockheed Aircraft Co.	Air Express		CML	5	PWw	425 H	45'	295 27' 6''	9' 6''	2,555	1,622	2 447	5 000	13 [illegible]	9 50
Lockheed Aircraft Co.	Vega J-6		CML	7	J-6	300 SS	41'	275 27' 6''	8' 6''	2,185	1 220	1 848	4 035	14 70	13 50
Lockheed Aircraft Co.	Vega Wasp		CML	7	PWw	425 SS	41'	275 27' 6''	8' 6''	2,465	1,170	1 566	4 220	15 60	10 00
Metal Aircraft Corp.	G-2-W	21,000	CML	8	PWw	410 SS	50'	300 32' 6''	9' 6''	3 360	1,340	2,440	5,800	15 [illegible]	13 81
Metal Aircraft Corp.	G-2-H	23 500	CML	8	PWh	510 SS	50'	360 32' 10''	9' 6''	3,460	1,440	2,540	6 000	16 [illegible]	14 50
Mohawk Aircraft Corp.	Pinto			2	K	90 Hz, SS	34' 11''	145 24' 2½''	7' 2''	1 125	200	625	1 800	11 72	18 93
Mohawk Aircraft Corp.	M-1-C			2	W	110 Hz, SS	34' 11''	145 24' 2½''	7' 2''	1 125	200	675	1 800	11 72	1[illegible]
Mono Aircraft Corp.	Monocoupe	2,835	CML	2	V	55 Hz	32'	145 19' 9''	6' 3''	828	349	522	1 350	9 44	24 05
Mono Aircraft Corp.	Monoport		CML	2	W or K	85 H	32' 2¾''	132 2 21' 5''	2' 1''	1,025	417	625	1,650	12 5	15 00
Mono Aircraft Corp.	Monocoach	6,250	CML	4	J-6	225 SS, H	39'	222 26' 0''	7' 9''	1,819	750	1 173	3,002	13 95	13 73
Moth Aircraft Corp.	Gipsy Moth 60 GM	4,500	OBD	2	Gy (DH)	90 W	30'	242 23' 11''	8' 9''	990	345	660	1,650	6 62	16 5
New Standard Aircraft Corp.	D-25A		OQL	5	J-6	225 SS	45'	350 26' 6''	10' 2''	2 055	710	1,290	3 345	9 56	14 9
New Standard Aircraft Corp.	D-26A		OQL	5	J-6	225 SS	45	350 26' 6''	10' 2''	2,055	765	1 345	3 400	9 71	15 1
New Standard Aircraft Corp.	D-27A		OQL	1	J-6	225 SS	45	350 26' 6''	10' 2''	2,055	765	1 345	3 400	9 71	15 1
New Standard Aircraft Corp.	D-29		OBL	2	Cir	90 W	30'	245 24' 11''	9'	1 097	210	535	1 63[illegible]	6 66	19 55
New Standard Aircraft Corp.	D-29A		OBL	2	K	90 SS Sty	30'	245 24' 9''	9'	1 075	210	535	1 610	6 52	1[illegible]
Nicholas-Beazley Airplane Co., Inc.	Barling NB-3	3 000	OML	3	L B	60 W	32' 9''	159 5 21' 11''	7' 3''	744	380	629	1 375	8 60	21 12
Nicholas-Beazley Airplane Co., Inc.	Barling NB-3V	5,000	OML	3	V	55 W	32' 9''	159 5 22' 3''	7' 3''	772	340	629	1 401	8 78	25 47
Nicholas-Beazley Airplane Co., Inc.	Barling NB-3G	3 000	OML	5	G	80 W	32' 9''	159 5 22' 5''	7' 3''	735	340	629	1,364	8 55	12 05
Paramount Aircraft Corp.	Cabinaire 165	2,250	CBL	4	J-6	165 H	32' 2''	309 24' 7''	9'	1 620	510	1,010	2,630	8 5	15 94
Paramount Aircraft Corp.	Cabinaire-110	7 200	CBL	4	W	110	33' 2''	307 24' 0''	9'	1,352	600	944	2,296	7 40	20 80
Parks Air College, Inc.	P-1	3 165	OBL	3	OX-5	90 Hz	29' 8½''	260 24' 7''	9' 4''	1 511	525	767	2 029	7 15	25 1
Parks Air College, Inc.	P-2	6 000	OBL	3	Ax	130 Hz	30'	283 25' 6''	9' 3''	1,450	990	900	2,800	8 43	16 0
Pheasant Aircraft Co., Inc.	H-10	2,895	OBL	3	OX-5	90 Hr	32' 6''	283 23' 6''	9'	1,297	600	285	2,082	7 5	25 15
Pitcairn Aviation, Inc.	Mailwing	10,000	OBL	1-	J-5	200 SS	33'	252 22' 10''	8' 10''	1,612	500	770	2,512	9 96	12 5
Pitcairn Aviation, Inc.	Super Mailwing		OBL	1-	J-5	200 SS	33'	252 22' 10½''	9' 3''	1,892		1 158	3,050	12 10	15 80
Pitcairn Aviation, Inc.	Sport Mailwing		OBL	3	J-5	200 SS	33'	252 22' 10''	9' 3''	1,842		1 158	3,050	12 10	15 80
Ryan Aircraft Corp.	Ryan B-5	15,250	CML	6	J-6	300 SS H	42' 4''	290 27' 11''	9' 10''	2 250	920	1 750	4,000	14 3	13 3
Ryan Aircraft Corp.	Ryan B-7	17 500	CML	6	PWw	4[illegible] SS H	42' 4''	290 27' 11''	9' 9''	2 900	950	1 783	4 233	15 3	10 2
Ryan Aircraft Corp.	Seaplane B-5	15,200	CMW	6	J-6	300 SS H	42' 6''	290 32'	10' 6''	2 516	930	1,518	4,100	15 0	13 6
Sikorsky Aviation Corp.	S-38		COA	12	2 PWw	840 H St	71' 8''	720 40' 3''	13' 10''	6 500	1,500	3 980	10,480	14 3	12 5
Simplex Aircraft Corp.	Red Arrow K-2-S	4 300	OML	2	K-5	90 W	34' 4''	160 22' 3''	7' 1''	1,190	243	585	1,795	11 10	19 60
Simplex Aircraft Corp.	W 2-S	5 300	OML	2	W	110 W	34' 4''	160 22' 3''	7' 1''	1,100	243	685	1,795	11 10	16 20
Spartan Aircraft Co.	C-3-165	6 750	OBL	3	J-6	165 SS H	32'	291 23' 10''	8' 10''	1,617	370	808	2,585	9 0	15 2
Spartan Aircraft Co.	C-3-225	8 000	OBL	3	J-6	225 SS H	32'	291 23' 2''	8' 10''	1,707	370	995	2,700	9 22	12 0
Stearman Aircraft Co.	C-4-A		OBL	3	J-6	300 SS	50'	306 26' 5''	10' 2''	2 250	755	1,520	3,800	12 5[illegible]	12 62
Stearman Aircraft Co.	C-3-B		OBL	3	J-6	225 SS	35'	273 23' 11''	9' 5''	1,741	900	959	2,700	9 38	12 00
Stearman Aircraft Co.	M 2		OBL	1	Cy	525 SS	46'	436 30' 2''	11' 1''	3,442	1,000	2,138	3,5[illegible]	12 79	10 6[illegible]
Stearman Aircraft Co.	LT 1		SBL	1	PWh	525 SS	49'	480 32' 8''	12' 6''	5 890	1 215	2,360	6 250	12 26	11 9[illegible]
Stinson Aircraft Corp.	SM-2AA	8,650	CML	4	J-6	165 SS	41' 8''	236 29'	8' 6''	1 972	612	1,180	3,15[illegible]	13 35	19 1[illegible]
Stinson Aircraft Corp.	SM-2AC	10 500	CML	4	J-6	225 SS	41' 8''	236 29'	8' 6''	2,091	[illegible]	1,12[illegible]	3,217	15 65	14 30
Stinson Aircraft Corp.	SM-1F	15,500	CML	6	J-6	300 SS	47' 1''	292 32' 8''	9'	2,6[illegible]	934	[illegible]	4,300	14 72	14 3[illegible]
Stinson Aircraft Corp.	SM-6B	19 500	CML	8	Pww	425 SS	52' 0½''	334 34' 3½''	9' 8''	3,39[illegible]	1,072	[illegible]	5,330	16 00	12 6[illegible]
Stout Metal Airplane Co.	4-AT-E	42,000	CML	12	3 J-6	500 SS H	74'	785 49' 10''	12' 8''	6 300	1,725	3,630	10,130	12 90	11 2[illegible]
Stout Metal Airplane Co.	5-AT-C	55 000	CML	14	3 Pww	1 275 SS H	77' 10''	835 49' 10''	15' 8''	[illegible],500	5 775	6,000	13,500	16 10	10 6
Stout Metal Airplane Co.	7-AT	51 000	CML	14	2 PWh 1 J-6	1 025 SS H	77' 10''	835 49' 10''	13' 8''	7 280	3 379	5 630	12 910	15 46	12 59
Swallow Airplane Co.	TP K		OBL	2	K	100 W	30' 11''	206 24' 1''	8' 7''	1,170	120	530	1,700	5 75	12 00
Swallow Airplane Co.	TP W		OBL	2	W	110 M	30' 11''	295 25' 9''	8' 7''	1,201	178	598	1739	5 88	15 80
Swallow Airplane Co.	TP	2,870	OBL	2	OX-5	90 W	30' 11''	290 23' 1''	8' 7''	1,270	190	555	1,825	6 1[illegible]	20 00
Swallow Airplane Co.	J-5		OBL	5	J-5	225 W	32'	301 25' 10''	8' 7''	1,716	407	984	2,700	9 00	15 50
Swallow Airplane Co.	F-28-Ax		OBL	3	Ax	150 W	32'	[illegible]00 22' 2''	8' 7''	1 574	800	923	2,497	8 4	18 00
Szekely Aircraft & Engine Co.	Flying Dutchman	2,000	OML	1	Sa	40 F	26'	186 18'	6' 8''	551 5	231 5		800	7 [illegible]	20 00
Taylor Bros. Aircraft Corp.	"Chummy"	4 650	SML	2	K	90 P	54'	165 5 22' 10''	7' 6''	1 082	212	564	1,646	10 00	18 3[illegible]
Texas Aero Corp.	Temple		OML		J-5	200	39' 4''	225 25' 10''	8' 3''		567		2,250	10 00	11 2[illegible]
Travel Air Mfg. Co.	B-4000	8 100		5	J-5	200 SS	33	289 23' 7''	9' 1''	1,885	400	1,015	2,900	10 03	14 50
Travel Air Mfg. Co.	D-4000	6,273	OBL	5	R-600	170 W H Hz	34' 8''	296 24' 6''	9' 11''	1,500	385	1,100	2,606	8 80	15 30
Travel Air Mfg. Co.	E-4000	5 525	OBL	3	W	110 W H Hz	34' 8''	296 24' 11''	8' 11''	1 550	350	950	2 200	17 80	21 00
Travel Air Mfg. Co.	6000 B	15,000	CML	6	J-6	300 SS	48' 6''	280 31' 2''	9' 3''	2,550	975	1,680	4 230	15 80	14 10
Travel Air Mfg. Co.	A-6000 A	10,000	CML	6	Pww	420 SS	54' 5''	340 31' 2''	9' 1''	3 250	885	2,000	2,250	6 20	13 1[illegible]
Viking Flying Boat Co.	Kittyhawk B-2	5 500	OBL	3	Y	105 Hs	28'	233 22' 6''	8' 8''	1 139	357	760	1,899	8 15	18 1
Viking Flying Boat Co.	Kittyhawk B-4	4 800	OBL	3	K-5	100 Hs	28'	233 22' 11''	8' 8''	1 107	362	768	1,875	8 05	18 0
Waco Aircraft Co.	Waco "90"	2 145	OBL	3	OX-5	90 Hz	30' 8''	286 23' 6''	9'	1,199		826	2,025	7 03	22 5[illegible]
Waco Aircraft Co.	Waco "165"	6,370	OBL	3	J-6	165 H Hr	30' 8''	286 23'	9'	1,576		1,071	1 525	9 03	15 7[illegible]
Waco Aircraft Co.	Waco "220" Str	7 535	OBL	3	J-5	220 H Hz	30' 8''	286 22' 6''	9' 2½''	1,550		1,050	2 600	10 10	11 8[illegible]
Waco Aircraft Co.	Waco "220" tap	8 525	OBL	3	J-5	220 M	30' 5''	222 22' 6''	9'	1,797		825	2 600	1 45	11 8[illegible]
Waco Aircraft Co.	225 Str. W	7 355	OBL	3	J-6	225 H Hs	30' 8''	286 22' 6''	9' 2½''	1 550		1 050	2 600	9 05	15 0[illegible]
Waco Aircraft Co.	225 Tap. W	8 335	OBL	3	J-6	225 H	30' 5''	227 22' 6''	9'	1 787		825	2 600	11 45	15 0[illegible]
Whittelsey Manufacturing Co.	Avian	4 995	OBL	2	Cir	95 W	28'	234 24'	8' 6''	910		690	1 600	6 30	15 70

TYPE
A—Amphibion
B—Biplane
C—Closed
D—Land or Seaplane
F—Flying boat
L—Landplane
M—Monoplane
O—Open
Q—Sesquiplane
S—Semi-closed
W—Seaplane

ENGINE. One engine unless stated in italics.
A—Anzani
Ax—Axelson
Cir—Cirrus
C 6—Curtiss
Co—Comet
Cy—Wright Cyclone
E—Wright Hispano-E
G—Genet
Gy (DH)—DH Gipsy
H—Henderson
179—Isotta
J 5—Wright Whirlwind
J-6—"New Whirlwind"
K—Kinner
L—Liberty
LB—Le Blond
LR—LeRhone
OX 5—Curtiss
PWh—Pratt & Whitney Hornet
PWw—Pratt & Whitney Wasp
R-600—Curtiss Challenger
SR—Super Rhone
SH—Siemens Halske
Sz—Szekely
V—Velie
Waf—Walter
W—Warner
Hr—Hess Warrior
Y—Yankee
*—Price without engine

PROPELLER
CR—Curtiss Reed
F—Flottorp
H—Hamilton
Hs—Hartzell
M—Metal
P—Paragon
Sty—Story
SS—Standard Steel
W—Wood
Wr—Westinghouse
Su—Supreme

FUSELAGE AN[illegible]
B—Bolted
Cor—Corrugated
D—Duralumin
F—Fabric covered
Mon—Monocoque
O—Open section
BRAKES
B—Bendix
Ex—Extra
H—Hydraulic

112	97	45	800		2,000	26	400	5	DB	Wd DF	Yes	DeD		Arl	209		Keystone-Loening—Commuter
144	126	57	1,070		14,500	335			WI-ST	Wd F	Yes		Yes				Keystone Patrician
115	100	45	1,200		14,000	75	900		DT-S	Wd F	Yes	SPA	B	HC	36		Laird Whirlwind
150	130	45	1,600		22,000	76	530		DT-S	Wd F	Yes	SPA	B	HC	Apl		Laird Whirlwind
130	120	55	1,200		12,000	76	500		DT-S	Wd F	Yes	SPA	B	BC	152		Laird Speedwing
175	151	55	1,800		20,000	76	150		DT-S	Wd F	Yes	SPA	B	BC	13a		Laird Speedwing
109	91	41	600		13,000	42	600	6	WI-ST	Wd F	Yes	DS	No	R	28	5%	Lincoln P-3
105	90	30	800		14,000	30	500	6	WI-ST	Wd F	No	DS	No	R	101	5%	Lincoln PT
185	121	55	1,200	11	16,000	100	900	14	W Mon	Wd-Pl	Yes	SC	B	OS	140	5%	Lockheed Vega—J-6
190	150	55	1,450	10	17,250	100	750	20	W Mon	Wd-Pl	Yes	SC	B	OS	102	5%	Lockheed-Air Express
155	125	55	1,200	11	16,000	100	800	14	W Mon	Wd-Pl	Yes	SC	B	OS	Apl	5%	Lockheed Vega-J-6
170	135	55	1,300	10	17,250	100	475	20	W-Mon	Wd-Pl	Yes	SC	B	OS	169	5%	Lockheed Vega-Wasp
117	112	60	1,111		11,500	140	700	22	WI-ST,D	D	Yes	D DeC	Yes	Arl	192	Yes	Metal-G-2-W
140	111	62	900		14,000	140	750	30	WI-ST,D	D	Yes	D DeC	Yes	Arl		Yes	Metal-G-2-H
111	100	36	1,100	10	18,000	37	472	8	WI-ST	Wd-F	Yes	P	B	Arl	265		Mohawk Pinto
111	100	38	1,100	10	18,000	37	472	6	WI-ST	Wd F	Yes	P	B	Arl	Apl		Mohawk—M 1-C
98	85	37	600		12,000	24½	550	4½	WI-ST	Wd F	Yes	S-Pl		OS	115	5%	Mono Aircraft—Monocoupe
125	100	42	1,000		20,000	32	900	7-5	WI-ST	Wd F	Yes	S-Pl	B	OS	244	5%	Mono Aircraft—Monosport
133	112	40	1,200		18,000	63	170	11	WI-ST	Wd F	Yes	S-Pl D	B	OS	201	5%	Mono Aircraft—Monocoach
105	80	40	700	10	16,000	25	500	5 5	WI-ST	Wd-F	Yes	SD	Op	R	197	5%	Moth — 60-GM
110	95	37	800		20,000	62			DBR F	Wd F	Yes	S-Pl-CP	B	OS	224	5%	New Standard—D-25A
111	100	37	800		20,000	62			DBR-F	Wd F	Yes	S-Pl-CP	B	OS	225	5%	New Standard—D-26A
120	100	37	800		20,000	62			DBR F	Wd F	Yes	S-Pl-CP	B	OS	226	5%	New Standard—D-27A
85	72	35	500		9,200	22			DBR F	Wd F	No	DS Pl CP	No	OS	109	5%	New Standard—D-29
95	71	35	590		14,600	32			DBR-F	Wd F	No	DS Pl CP	No	OS	[illegible]	5%	New Standard—D-29A
105	87	39	600		18,000	18	500	4 75	WI-ST	DR-cov	Yes	SPCD	No	C	174	1%	Nicholas-Beazley Barling—N.B-3
105	87	39	600		11,000	18	500	4 75	WI-ST	DR-cov	Yes	SPCD	No	C	259	1%	Nicholas-Beazley Barling—NB-3W
111	95	39	800		17,500	18	800	4 5	WI-ST	DR-cov	Yes	SPCD	No	C	231	5%	Nicholas Beazley Barling—NB-3G
120	103	40	850		12,000	50	800	12	WI ST	Wd-F	Yes	SD	B	Hy	305	Yes	Paramount Cabinaire—165
101	90	38	500		4,000	42	411	38	WI-ST	Wd F	Yes	SD	B	I	Apl	Yes	Paramount Cabinaire No. 110
102	90	34	500		11,000	35	301	11	WI-ST	Wd F	Yes	SFD	No	C	179	5%	Parks—P-1
111	100	38	871	14	14,500	32	450	12	WI-ST	Wd-F	Yes	SFD	B	RF	208	5%	Parks—P-2
100	90	35	500		12,500	38	800	4	WI-ST	Wd-F	Ex	SFD	Ex	BC	3b		Pheasant—H10
136	101	45	1,600		11,000	80	600		WI-ST	Wd F	Yes	S	Yes	Arl	15	1%	Pitcairn—PA-5
144		50							WI-ST	Wd-F		S		O	92		Pitcairn—PA-6 Super Mailwing
148		50							WI-ST	Wd-F		S		O	92		Pitcairn—PA-6 Sport Mailwing
140	110	50	1,000	14	14,000	100	800	11	WI-ST	Wd-F	Yes	SD-Pl	B	Arl	142	5%	Ryan Brougham—B-5
150	120	60	1,350	10	20,000	100	500	23	WI-ST	Wd-F	Yes	SD-Pl	B	Arl	262	5%	Ryan Brougham—B-7
135	105	60	1,000	11	10,000	100	600	14	WI-ST	Wd F	Yes		B	No	142	5%	Ryan—B-5 Seaplane
125	110	55	980	13	18,000	264	700	44		D F	Yes	DeDA		OS	126	5%	Sikorsky—S-38
125	113	38	1,000	20	12,000	40	620	4 1	WI-ST	Wd F	Yes	S	Op	Hy	4	1%	Simplex—Red Arrow K-2-S
123	102	38	1,170	17	14,000	40	150	7	WI-ST	Wd F	Yes	S	Op	Hy	2 8	1%	Simplex—Red Arrow W-2-S
132	105	48	200	25	17,000	65	450	11	WI-ST	Wd-F	Yes	DS	Yes	S Hy	113	Yes	Spartan—C-3-165
134	112	50				65	450	15	WI-ST	Wd F	Yes	DS	Yes	S Hy		Yes	Spartan—C-3-225
143	118	50	900		11,000	95	775	15	WI-ST	Wd F	Yes	SPC	Yes	B Hy	Apl	1%	Stearman "Junior Speed Mail"
113	110	42	1,000		16,000	95	800		WI-ST	Wd F	Yes	SPC	Yes	B Hy	251	5%	Stearman—Business Speedster
147	126	52	950		11,600	136	800		WI-ST	Wd F	Yes	SPC	Yes	Hy	127	1%	Stearman—Speed Mail
134	111	55	800		11,000	145	720		WI-ST	Wd F	Yes	SPC	Yes	B Hy	180	1%	Stearman Light Transport
120	105	45	700		11,000	40	650	4	WI-ST	Wd F	Yes	DS	Std	HY	145	1%	Stinson—SM-2AA
131	113	45	1,200		20,000	73	675	12	WI-ST	Wd F	Yes	DS	Std	HY	194	5%	Stinson—SM-2AC
151	111	50	1,000		17,000	90	730	15	WI-ST	Wd-F	Yes	DeD	Std	HY	136	5%	Stinson—SM-1F
140	123	50	1,000		10,300	110	625	23	WI-ST	Wd-F	Yes	DeD	Std	HY	217	5%	Stinson—SM-6B
109	107	58	950	17	14,500	231	800	45	D-cor	D-cor	Yes	DeD	Hy	RC	132	Yes	Ford Stout—4-AT-E
131	111	64	903	16	14,000	277	125	50	D-cor	D-cor	Yes	DeD	Hy	RC	165	Yes	Ford Stout—5-AT-C
134	112	63	900	19	14,088	281	625	50	D-cor	D-cor	Yes	DeD	Hy	RC	246	Yes	Ford Stout—7-AT
100	90	35				28	195	1½	WI-ST	Wd F	Yes	DS	No	C	100		Swallow—TP-K
100	80	35				28	150	5½	WI-ST	Wd F	Yes	DS	No	C	251		Swallow—TP W
90	78	35	900		11,000	26	660	7	WI-ST	Wd-F	Yes	DS	No	C	114		Swallow TP
125	101	40	1,300		20,000	62	800	11	WI-ST	Wd-F	Yes	DS	Op	C	59		Swallow F-3
111	90	40	900		17,000	62	800	4 5	WI-ST	Wd F	Yes	DS	Op	C	125		Swallow F-28-Ax
90	80	30	600		11,000	30	360		WI-ST	Wd F		SC	No	RAR	Apl		Szekely Flying Dutchman
110	100	38	800		11,000	25	450	6	WI-ST	Wd F	Yes	SPD	Op	RAR		1%	Taylor "Chummy"
						80			WI-ST	Wd F		S			145		Texas—Temple
125	100	53	800	14	14,000	47	500	13	WI-ST	Wd F	Yes	SPCD	B	C	146	Yes	Travel Air—B-4000
130	103	46	800			17			WI ST	Wd F	Yes	SPCD	Bex	C	149	Yes	Travel Air—D-4000
105	90	43	125			17	720		WI ST	Wd F	Yes	SPCD	Bex	C	112	Yes	Travel—W-4000
170	140	60	800	19	14,000	82	700	14	WI-ST	Wd F	Yes	DeCD	B	O	159	Yes	Travel Air—6000B
155	120	60	1,000	15	15,000	120	650	20	WI-ST	Wd F	Yes	DeCD	B	O	116	Yes	Travel Air A-6000-A
110	90	40	650			35	500	4 1	WI-ST	Wd F	Yes	SPD	Op	RD	134	5%	Viking—B2
110	90	38	650			35	500	4 1	WI ST	Wd F	Yes	SPD	Op	RD	166	5%	Viking—B4
96	85	33	600		11,000	37		8	WI ST	Wd-F	Yes	SPD	Ex	OS	33		Waco "90"
121	100	44	700		15,000	65		11	WI-ST	Wd-F	Yes	SPD	B		168		Waco—165
125	105	44 1	1,000		18,000	65		12	WI ST	Wd-F	Yes	SPD	B		41		Waco 220 Straight Wing
128	110	32	1,100		19,000	87		12	WI ST	Wd F	Yes	SPD	B		123		Waco 220 Taper Wing
128	111	42	1,200		14,000	65		12	WI-ST	Wd F	Yes	SPD	B	108	250		Waco—225 Str W
138	110	42	1,400		14,000	82		12	WI-ST	Wd F	Yes	SPD	B	[illegible]	250		Waco—225-Tap-W
102	91	33	720		17,000	24	450	4 5	WI-ST	Wd-F	Yes	SCD Pl	No	R			Whittelsey Avian

D WING CONSTRUCTION:
P —Plywood cover
R —Riveted
S —Steel
T —Tubing
Wd —Wood
WI —Welded
L —Lockheed
O —Optional
S —Sanzedite
Std—Standard

LIGHTS:
N —Navigation lights
Op—Optional

CONTROL:
A —Arena
C —Cables
D —Dual
De—Wheel
P —Push rods
S —Stick
Pl —Pedal

SHOCK ABSORBERS:
Arl —Aerol
C —Cord
D —Compression
Cm —Cruse
Hy —Hydraulic
O —Oleo
P —Pneumatic
B —Rubber
RAR Rusco Aero Rings
S —Coil Spring
T —Trombone

TYPE CERTIFICATE
Apl—Applied for and is pending

GUARANTEE:
N —New

MANUFACTURERS' SPECIFICATIONS ON ENGINES AVAIL

THE TABLE BELOW IS BELIEVED TO BE ACCURATE BUT *AVIATIO*

This table will appear monthly and ev

MANUFACTURER OR AGENT	Engine	Cooling System	Cylinder Arrangement	No. of Cylinders	Strokes per Cycle	Propeller Drive	Rated Hp. and R.P.M. at Sea Level	Maximum Hp. and R.P.M. at Sea Level	Weight Dry Without Hub or Starter	Weight Per Rated Hp.	Bore and Stroke (in.)	Compression Ratio	B.M.E.P.
Allison Engineering Co.	V1410	A	IV-45°	12	4	D	410-1900	450-1900	1000	2.44	4⅝x7	5.3	120
Allison Engineering Co.	VG1410	A	IV-45°	12	4	G	410-1900	450-1900	1125	2.67	4⅝x7	5.3	120
Allison Engineering Co.	V1650	W	IV-45°	12	4	D	420-1[illegible]	450-1[illegible]	985	2.18	5 x7	5.4	122
American Cirrus Engines	Cirrus Mark III	A	L	4	4	D	95-2100	90-2[illegible]	275	2.90	[illegible]	5.4	122
Axelson Machine Co.	Axelson A7R	A	Rad	7	4	D	150-1800		430	2.87	4½x5½	4.7	
Brownback Motor Lab., Inc.	C-400	A	[illegible]	[illegible]	4		[illegible]		275	[illegible]	[illegible]	[illegible]	[illegible]
Comet Engine Corp.	Comet	A	Rad	7	4	D	150-1800		393	2.62	[illegible]	[illegible]	
Continental Aircraft Engine Co.	A70	A	Rad	5	4	D	165-2000	183-2300	425	2.58	[illegible]	5.5	122
Curtiss Aeroplane & Motor Co.	OX-5	W	V-90°	8	4	D	90-1400		325	[illegible]	4 x5	[illegible]	
Curtiss Aeroplane & Motor Co.	OXX-6	W	V-90°	8	4	D	100-1400		400	[illegible]	[illegible]	[illegible]	
Curtiss Aeroplane & Motor Co.	C-6A	W	L	6	4	D	160-1500	165-1580	420	2.62	[illegible]	5.5	133
Curtiss Aeroplane & Motor Co.	D12	W	V-60°	12	4	D	435-2300	460-2500	[illegible]	[illegible]	4½x6	5.5	135
Curtiss Aeroplane & Motor Co.	Conqueror	W	V-60°	12	4	D	600-2400	575-2450	[illegible]	[illegible]	5⅛x6¼	5.8	[illegible]
Curtiss Aeroplane & Motor Co. Inc.	Geared Conqueror	W	V-60°	12	4	G[a]	600-2400	625-2450	[illegible]	[illegible]	5⅛x6¼	5.8	138
Curtiss Airplane & Motor Co.	Chieftain	A	H	12	4	D	600-2100	615-2300	900	1.80	[illegible]	5.5	130
Curtiss Airplane & Motor Co.	Challenger	A	Rad	6	4	D	170-1800	185-1900	400	2.47	[illegible]	5.5	124
Dayton Airplane Engine Co.	Bear	A	L	4	4	D	110-1550	120-1800	[illegible]	[illegible]	[illegible]	[illegible]	115
Hallet Mfg. Co.	H 526	A	Rad	5	4	D	130-1900		525	[illegible]	[illegible]	[illegible]	
Irwin Aircraft Co.	Irwin 79	A	Rad	[illegible]	4	D	[illegible]-1700	[illegible]-2200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kinner Airplane & Motor Corp.	K 5	A	Rad	5	4	D	100-1825	112-1860	285	[illegible]	[illegible]	[illegible]	
Kimball Aircraft Corp.	Beetle, Model K	A	Rad	7	4	D	135-1850		370	2.77	[illegible]	[illegible]	100
Lambert Aircraft Engine Corp.	Velie M-5	A	Rad	5	4	D	65-2000		320	[illegible]	[illegible]	[illegible]	
Le Blond Aircraft Engine Corp.	60 Model 5-D	A	Rad	5	4	D	65-1950	68-1550	220	[illegible]	[illegible]	5.5	112
Le Blond Aircraft Engine Co.	90 Model 5-D	A	Rad	[illegible]	4	D	90-1925	94-1975	285	[illegible]	[illegible]	5.5	109
Lycoming Mfg. Co.	R-645	A	Rad	9	4	D	185-2000		[illegible]	[illegible]	[illegible]	[illegible]	
Menasco Motors Co.	B-2 Salmson	A	Rad	[illegible]	4	D	260-1800	270-1500	545	[illegible]	[illegible]	[illegible]	
Michigan Aero Engine Co.	Rover	A	LI	4	4	D	55-1955	56-2250	225	[illegible]	[illegible]	[illegible]	115
Packard Motor Car Co.	1A 2775	W	X-60°	24	4	D	[illegible]-2000	1500-2200	[illegible]	[illegible]	[illegible]	5	150
Packard Motor Car Co.	[illegible]A-1500	W	V-60°	12	4	D	600-2500	650-2700	[illegible]	[illegible]	[illegible]	5.5	[illegible]
Packard Motor Car Co.	[illegible]A-1500	W	V-60°	12	4	G	600-2500	650-2700	[illegible]	[illegible]	[illegible]	5.5	[illegible]
Packard Motor Car Co.	[illegible]A-1500	W	V-60°	12	4	D	600-2500	650-2700	[illegible]	[illegible]	[illegible]	5.5	140
Packard Motor Car Co.	[illegible]A-2500	W	V-60°	12	4	D	800-2000	835-2100	[illegible]	[illegible]	[illegible]	5.5	155
Packard Motor Car Co.	[illegible]A-2500	W	V-60°	12	4	G	800-2000	835-2100	[illegible]	[illegible]	[illegible]	5.5	155
Pratt & Whitney Aircraft Co.	Wasp	A	Rad	9	4	D	[illegible]-2000	450-2100	[illegible]	[illegible]	[illegible]	[illegible]	124
Pratt & Whitney Aircraft Co.	Geared Wasp	A	Rad	9	4	G[a]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	124
Pratt & Whitney Aircraft Co.	Hornet	A	Rad	9	4	D	525-[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	123
Pratt & Whitney Aircraft Co.	Hornet B	A	Rad	9	4	D	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Pratt & Whitney Aircraft Co.	Geared Hornet B	A	Rad	9	4	G[a]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	
Pratt & Whitney Aircraft Co.	Hornet A	A	Rad	9	4	G[a]	525-1900		[illegible]	[illegible]	[illegible]	[illegible]	123
Quick Motors Co.	Quick Radial	A	Rad	5	4	D	125-1550		[illegible]	[illegible]	[illegible]	[illegible]	
Siemens & Halske A. G.*	Yankee 5	A	Rad	5	4	D	85-1515		[illegible]	[illegible]	[illegible]	[illegible]	
Siemens & Halske A. G.*	Yankee 7	A	Rad	7	4	D	113-1520		[illegible]	[illegible]	[illegible]	[illegible]	
Siemens & Halske A. G.*	Yankee 9	A	Rad	9	4	D	128-1735		[illegible]	[illegible]	[illegible]	[illegible]	
Szekely O. F. Corp.	SR-3	A	Rad	3	4	D	[illegible]-1900		155	[illegible]	[illegible]	5	100
Tips & Smith Inc.†	Super-Rhone	A	Rad	9	4	D	125-1450		515	[illegible]	[illegible]		
J. Walter & Co.*	Walter 5	A	Rad	5	4	D	[illegible]-1600		225	[illegible]	[illegible]	[illegible]	115
J. Walter & Co.*	Walter 7	A	Rad	7	4	D	95-1500	[illegible]-1600	[illegible]	[illegible]	[illegible]	5	108
J. Walter & Co.*	Walter 9	A	Rad	9	4	D	155-1750	153-1550	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Warner Aircraft Corp.	Scarab	A	Rad	7	4	D	110-1850	120-1525	[illegible]	[illegible]	[illegible]	[illegible]	115
Wright Aeronautical Corp.	Whirlwind Five	A	Rad	5	4	D	145-2000		[illegible]	[illegible]	5 x5½	[illegible]	
Wright Aeronautical Corp.	Whirlwind Seven	A	Rad	7	4	D	225-2000		[illegible]	[illegible]	5 x5½	[illegible]	
Wright Aeronautical Corp.	Whirlwind Nine	A	Rad	9	4	D	300-2000		[illegible]	[illegible]	5 x5½	[illegible]	
Wright Aeronautical Corp.	Whirlwind 55	A	Rad	[illegible]	4	D	220-2000	225-2000	[illegible]	[illegible]	[illegible]	5.5	123
Wright Aeronautical Corp.	Cyclone R1530	A	Rad	9	4	D	525-1900	560-2000	[illegible]	[illegible]	[illegible]	[illegible]	160
Wright Aeronautical Corp.	Gipsy	A	L	4	4	D	85-1900	100-2100	245	2.88	[illegible]	[illegible]	

* — Engines of foreign manufacture
† — Rebuilt
a — Applied for
A — Air cooled
Aa — Aluminum alloy
Am — Aeromarine
Al — Aluminum
AS — As smal or Scintilla
Au — Automatic
B — Battery ignition
BR — Robert Bosch
Bs — Scintilla booster magneto
C — Cast iron

Ch — Champion
Cylinder Construction
first—head
second—walls or waterjacket
third—sleeve, if any
D — Direct
De — Delco
Du — Duplex
Dx — Dixie
DM — Dual Magneto
Ec — Eclipse
E — Ensign

Sx — E[illegible]
G — Ge[illegible]
G[1] — 5.3[illegible]
G[2] — 2.1[illegible]
G[3] — 5.2[illegible]
GD — G[illegible]
H — H[illegible]
Hd — H[illegible]
Hy — H[illegible]
I — I[illegible]
Ir — C[illegible]
L — Cy[illegible]
Ms — M[illegible]

...ABLE FOR COMMERCIAL USE AS COMPILED BY *AVIATION*
...Y DOES NOT ASSUME RESPONSIBILITY FOR THE FIGURES GIVEN
...rrections and suggestions are invited

Displacement (Cu. In.)	Frontal Area (Sq. Ft.)	Diameter of Mounting Ring or Distance Between Bearers (In.)	Height of Overall Diameter (In.)	Length Without Starter (In.)	Guaranteed Fuel Consumption at Rated Hp. Lb/Hp Hr	Oil Consumption Lb/Hp Hr	Valve Mechanism	Cylinder Construction (see Key)	No. Intake Valves Per Cylinder	Make Spark Plugs Supplied with Engine	No. Exhaust Valves Per Cylinder	Type of Ignition	No. Carburetors	Make Carburetor	Make Starter	Are Exhaust Manifolds Provided	Shipping Weight Crated	Dept. of Commerce Approval	Cost at Factory
1410	17	46¾	76⅛	55	.03	ohc	Al, S		2	BG	1	2M	De	1	Sg²	Ec			Y	
1410	17	46¾	85¼	55	.03	ohc	Al, S		2	BG	1	2M	De	1	Sg²	Ec			Y	
1650	17	46¾	76⅛	55	.025	ohc	Al, S		2	BG	1	2M	De	1	Sg	Ec			Y	
310	18¾	41¾	36⅜	54	.021	prr	Al, B		1	BG	1	2M	Sc	1	Sg	Op		400	50	1,600
612	16⅛	36⅜	35	52	.017	prr	Al, S		1	BG	1	2M	Sc	1	S&E			750	16	2,300
397	13	37		36	.011	prr	Al, C		1	Ch	1	M	DB	1	Sg	Op	N			1,840
544	17¼	46¾	35⅛	52	.03	prr	Al, S		1		1	2M	Sc	1	Sp	Op		800	S	
502	20	41½	57¹⁵⁄₁₆	55	.03	prr	Al, S		1	BG	1	2M	Sc	1	Op	Y			32	2,700
568	12¾			55	.030	prr	Ma, C		1	AC	1	1M		1	Z				Y	
573	15⅛	59	57¹³⁄₁₆	55	.030	prr	Ma, C		2	AC	2	2M	Sp	1	Z	U	N	865	Y	
1145	15⅛		56⅜	52	.015	ohc	Al, Al, B		2	BG	2	2M	Sc	2	Z	Ec	N	1080	10	
1569	15⅛		56⅜	52	.015	ohc	Al, Al, B		2	BG	2	2M	Sp	2	Z	Ec	N	1060	8	
1569	15⅛		56⅜	52	.015	ohc	Al, Al, B		2	BG	2	1M	Sp	2	Sg	Ec	N	1150	7	
1690	23⅜	45¾	51¹³⁄₁₆	52	.025	ohc	Al, B		2	BG	2	DM	Sc	2	Sg	Ec	N	1525	8	
605	19	41¾	35⅜	48	.020	prr	Al, S		1	BQ	1	2M	Sc	1	Sg	Ec	N	850	5	
445	16	38⅜	34⅜	325	.0125	prr	Al, N		1	BQ	1	2M	Sc	1	Sg	Ec	N	550	11	1,450
526	18⅛	45	37			prr	C		1	BQ	1	2M	DB	1	Z					1,700
779	45⅜	25	11	45	.0181	Am	Aс, B		1	BB	1	1M	DB	2	Wf			100	N	425
372	14	44⅜	52⅜	55	.035	prr	Al, B		1	BQ	1	2M	Sc	1	Sg	Hd	N	300	3	1,800
585	17	45	57⅜			prr	Al, NI		1		1	2M	Sc	1	Sg	Eo				
540	19¾	45	28¹³⁄₁₆	55	.035	prr	Al, NI		1	Ch	1	2M	Sc	1	Sg	Ec	N	470	4	1,050
250	5	32⅜	32⅝	34	.015	prr	IC		1		1	DM	Sc	1	Sg	Ec	N	460	12	1,230
550		32⅜	22¾	38	.015	prr	IC		1		1	DM	Sc	1	Sg	Ec	N	510	20	1,610
644		42⅝	41⅜	55	.015	prr	IC		1		1	Sd	Sc	1	Sg	Y			27	
		49⅜	38⅛	42	.025	prr	Al, B		1		1	2M	O	1	Z	N				3,250
5 267		31⅞	37⅞	55	.025	prr	Al, NI		1	AC	1	2M	O	1	Sg	N		25		1,200
2775	22	14½	45⅝	74⅜	52	.03	ohv		2	BG	2	4M	Sc	2	Sg	O	N			35,000
1530	4	03	15⅜	33⅛	33⅜	52	.015	ohv		2	BG	2	2M	Sc	2	Sg	Ao	N	1275	Y	12,000
1530	4	03	15⅜	33⅛	34⅛	52	.015	ohv		2	BG	2	2M	De	2	Sg	Ao	N	1390	18	12,575
1530	4	03	18⅜	36⅛	34⅛	52	.015	ohv		2	BG	2	2M	Sc	2	Sg	Ao	N	1275	N	12,000
2539	4	8	18⅛	36⅛	69	52	.015	ohv		2	BQ	2	2M	Sc	2	Sg	Ao	N	2450	19	15,425
2539	3	1	18⅛	36⅛	74⅜	52	.015	ohv		2	BQ	2	2M	De	2	Sg	Ao	N	2340	N	19,375
1344		23⅜	45¾	55	.035	prr	Al, B		1	BQ	1	2M	Sc	1	Sg		N	1150	14	7,200
1344		23⅜	47	55	.035	prr	Al, B		1	BQ	1	2M	Sc	1	Sg		N	1200		8,200
5 1690		23⅜	55⅛	44⅝	55	.035	prr	Al, B		1	BG	1	2M	Sc	1	Sg	Ec	N	1400	15	8,500
1660		23⅜	56⅜	49⅝	55	.055	prr	Al, B		1	BG	1	2M	Sc	1	Sg	Ec	N	1600		9,500
5 1690		23⅜	54⅜	44⅝	55	.035	prr	Al, B		1	BG	1	DM	Sc	1	Sg	Op	N	1350	29	9,500
667		19¾	36		55	.035	prr	Al, B		1	Ch	1	2M	Sc	1	Sg					1,750
317		14	33⅜	34	32	.022	prr	Al, B		1	O	1	2M	O	1	Sm	O	Y	695	Ex	2,100
445		14	33⅜	34	32	.022	prr	Al, B		1	O	1	2M	O	2	Sm	O	Y	776	Ex	2,500
668		16	40⅜	35⅝	32	.022	prr	Al, B		1	O	1	2M	O	2	Sm	O	Y	806	Ex	2,527
191	2 3	97⅛		23⅜	31	.037	prr	C		1		1	2M	DB	1	Z	N	N	205		785
667	4 25	11		31		31	.036	prr	Al, C		1	Sp	1	1M	Dz	1	Z			400	N	2,250
441		11	35	37	27.5	50	.028	prr	Al, B		1	AC	1	2M	Sc	1	Sg		Y	580	Y	1,835
444		12	6	37	27.5	49	.026	prr	Al, B		1	AC	1	2M	Sc	1	Sg		Y	580	Y	2,355
572		14	36	39	35.5	49	.026	prr	Al, B		1	AC	1	2M	Sc	1	DuZ		Y	670	Y	2,940
422		17		33¾	27¾	50	.01	prr	Al, B		1		1	2M	Sc	1	Sg		Y			2,485
440		19¼	45	28³⁄₁₆	55	.035	prr	Al, B		1		1	2M	Sc	1	Sg		Y	850	23	3,000
751		19¼	45	28¹³⁄₁₆	55	.035	prr	Al, B		1		1	2M	Sc	1	Sg		Y	670	26	
975		19¼	45	28¹³⁄₁₆	55	.035	prr	Al, B		1		1	2M	Sc	1	Sg		N	1000	21	4,600
788		19¾	45	33¼	55	.035	prr	Al, B		1	AC	1	2M	Sc	1	Sg		N	1000	15	5,300
1753		23⅜	53¹⁵⁄₁₆	40⅝	55	.035	prr	Al, B		1	BG	1	2M	Sc	1	Sg		N	1530	17	8,600
318		11¹³⁄₁₆		45¼	55	.010	prr	Al, C		1		1	2M	Sc	1	Sg			500		

...ira
...ared
...epicyclic gear
...reduction gear
...reduction gear
...neral Electric
...xagonal
...ywood
...lloy
...verted
...st Iron
...linders in line
...eel

M— Magnetic
NI— Nickel Iron
N— No
Op— Optional
O— Own
Ohc— Overhead cam
prr— Push rods and rocker arms
Rad— Radial
Rad S— Staggered Radial
S A E.—S A E Mounting
Sc— Scintilla
Scd— Scintilla—Dual Magneto
Sg— Stromberg

Sg¹— Stromberg NA-U5 duplex
Sg²— Stromberg NAS-8E
Sm— Sum
So— Solex
Sp— Splitdorf
S— Steel
U— U S L. Electric
V— Vee
W— Water cooled
Wf— Winfield
X— Extra
Y— Yes
Z—Zenith

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AVIATION

The Oldest American Aeronautical Magazine

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Contents for January 18, 1930

Volume 28, Number 3

COMING

A tabulation of mergers and consolidations in the industry ¶The operation of Aviation Credit Corporation ¶The duties and responsibilities of the aircraft factory foreman ¶Coming descriptions—the Curtiss Condor the new Keystone-Loening Amphibian, the Savoia Marchetti amph bian

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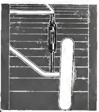
A MODERN SHOCK UNIT -GRUSS



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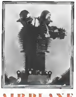

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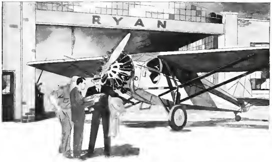
Factory and General Offices
Corner Randolph St. and Boyle Ave.
Los Angeles, California
(P. O. Box 337)

Axelson AIRPLANE *Engines*



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By inaugurating a "flat-rate" service system, Ryan again brings to airplane ownership a new and striking economy Now, Ryan owners can learn the exact cost of any repair operation—before the work is undertaken.

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REALIZING that the empirical period in the manufacture of aircraft is past—and that the Aviation Industry is now going forward on a production basis

WE ANNOUNCE the establishment of a new service facility—The Aviation Service Division of The Linde Air Products Company.

THE PURPOSE of this division is to co-operate with and advise the Aviation Industry on the efficient application of oxy-acetylene welding to its production requirements—duplicating in this industry a facility largely responsible for the economic success of the oxy-acetylene process in the whole industrial field.

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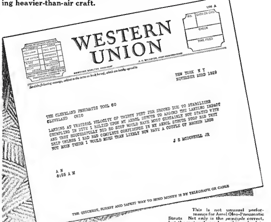
....*"I had complete confidence in my Aerol Struts"*

BELOW is a message received from J. S. McDonnell after a mishap to his ship entered in the Guggenheim Competition. It is of interest to every man building or operating heavier-than-air craft.



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NOVEMBER 23RD 1929

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CLEVELAND OHIO

LANDING AT VERTICAL VELOCITY OF THIRTY FEET PER SECOND DUE TO STABILIZER CRUMPLING IN DIVE I RELIED UPON MY AEROL STRUTS TO ABSORB THE LANDING IMPACT AND THEY SUCCESSFULLY DID SO STOP WOULD HAVE MOST CERTAINLY NOT STAYED WITH SHIP UNLESS I HAD HAD COMPLETE CONFIDENCE IN MY AEROL STRUTS STOP HAD THEY NOT BEEN THERE I WOULD MORE THAN LIKELY NOW HAVE A COUPLE OF BROKEN LEGS

J S MCDONNELL JR

A N
8:55 A M

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This is not unusual performance for Aerol Oleo-Pneumatic Struts Not only is the *principle* correct, but the materials, workmanship and safety factor insures efficient functioning of the struts under very extreme conditions. *That is why more Aerol Struts are in use today than any other make of shock absorber*

AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

A McGraw-Hill Publication   Established 1916

EDWARD P WARNER, *Editor*

Volume . . . **January 18, 1930** . . . Number

A Word for the Forgotten Man

By far the most significant feature of the many replies received to our recent inquiry on the depletion of the ranks of government technical aviation personnel was the absolute frankness with which the commercial industry approached the problem. In fact, the straight thinking and general absence of self-interest was in refreshing contrast to the manner in which government departments have in some cases officially handled the matter.

The obvious remedy, the raising of government salaries to place them on a comparable basis with commercial compensation for equivalent work, has often been mentioned. Carried to an extreme, this implies the need of a basic change in civil service classifications or of special legislation favorable to aviation personnel alone. Yet, the real crux of the problem in a number of cases in the government aviation services is not to secure pay higher than other equivalent branches of government service, but only to insure the payment of rates already established. With this really accomplished, commercial competition for subordinate personnel can commonly be met on a comparable footing.

In order to establish the setting for an analysis indicating how the government's interests may be protected without the need for heroic action, it should be noted that while the civil service commission establishes the qualifications for a given class of employment the rates of pay are set by a different body. In many cases where there are six or seven rates of pay tabulated for a given title or classification, the upper rates are withheld from aviation personnel, and in most instances a majority of those in a classification are actually paid rates falling within the lower third of the available range. The press has at times heralded alleged increases in established legal rates of pay when as a matter of fact new rates were merely interpolated between existing rates. The practical result was that when a man was recommended for promotion it would take two separate raises to achieve what formerly had been accomplished by one. The authority which establishes legal rates of pay is entirely divorced from the authority that applies them, and the higher rates may exist for years on the books without anyone actually being paid them.

For years, despite a wide range of rates of pay legally established for each classification of duty, raises have been made almost solely when resignations were effected. Furthermore, while a new man quite unknown to the local activity might be appointed direct from a civil service registry to fill a vacancy high up in the organization, a man already in the employ of the local activity, who had similarly qualified by passing the civil service examination for the higher rank, required reference to headquarters, often involving months of time and volumes of correspondence to effect the raise.

Now when resignations came as fast as they did during the past year, this machinery of promotion became entirely too involved, and while quotas were kept up approximately by intensified local activity, the average rate of pay of the personnel rapidly shrank until it was and is far below that of other government agencies similarly functioning. And the situation has been further complicated by a general order, now being reviewed, that specific raises are only to be considered once a year, and that in cases of resignations only one promotion is to be effected, instead of a general moving up all along the line.

While such a ruling may be entirely fair in long-established and strictly military activities, or activities related to inactive industries such as ship-building, where personnel turnover is at a minimum, it works to the distinct disadvantage of the aviation civil service personnel. Their rates of pay now average, and are

likely to continue to average, far less than the other activities, thanks to the far greater normal turnover of personnel in a service with an extremely active commercial counterpart.

Such at least is the situation in one leading governmental aviation activity. Possible steps to meet the situation and forestall further depletions of personnel are almost obvious. Less red tape and the placing of more authority for apportioning expenditures for personnel in the hands of those directly charged with aviation developments, subject of course to the limitations of budget expenditures and civil service regulations for qualifications, would do much to alleviate the situation. If government aviation salaries actually paid can be brought on a parity with those in other government activities, most of the differential which now attracts personnel to commercial industry will be automatically removed. There is serious matter here for the consideration of wage boards, local civil service boards, and the heads of the Departments immediately concerned,—and the interest of the aircraft industry is obvious.

//

Collisions in Mid-Air

THE recent mid-air collision of two cabin planes engaged in moving picture work near Los Angeles, with the resultant loss of ten lives, has horrified the country. Another collision a year ago, in which a transport machine was involved and in which there was again heavy loss of life, had an equally shocking effect. The suddenness of collision, when devastating calamity may come without an instant's warning and under the best of flying conditions, makes it more than ordinarily distressing. Although such accidents are comparatively rare, they cannot by any means be disregarded by those responsible either for the planning of aircraft operations or for the development of airplane design.

Two planes were flying parallel about five hundred feet apart when one, slightly above and ahead of the other, was thrown into a bank and turned into its companion at an angle of approximately forty-five degrees. It appears from somewhat meager accounts that the planes met at an angle completely blind for one and partially blind for the other, and therein lies the lesson.

The open biplane, which for a long time was the only standard type, had a substantial blind area forward and below the lower wing. Everyone knew it. It advertised itself, and therein lay its safety. A pilot was ever conscious of the blind zone, and he was on the lookout.

No longer does the open-cockpit biplane hold the field alone. New types have come into use, and have enormously improved vision,—in a certain sense,—as one of their major merits. Planes offering perfect clarity of vision along the flight path and for a considerable distance on every side of it have become commonplace, but that very improvement brings a menace if it leads us to assume that the danger of collision has been eliminated.

There are a number of types admirable in all their flying qualities, and with excellent vision to the front, which are almost completely blind when turning. As soon as the plane is banked, the wing cuts off the pilot from all view of the region into which he is swinging, and apparently that lies behind the recent disaster. No one will ever know in all its details exactly what happened over the fringe of the Pacific, but observation of many cases in which no collision did result leaves no doubt that many pilots otherwise skillful and careful hardly realize how much the effective vision characteristics of a plane are modified by banking and changing course. The writer of this editorial has frequently been astonished, and when he was riding as a passenger more than a little alarmed, at the abruptness with which a pilot flying over a crowded airport would go into a steep bank and a sharp turn with a plane in which he sat below the wing, and without any preliminary survey of the region into which he was about to turn.

There is no panacea for collision. The first requirement is care, care, and yet more care upon the part of every pilot. The air traffic rules must be obeyed, and where they are not obeyed by individual inclination they must be enforced. Special provisions must cover airports at which traffic is unusually dense, and they too must have unquestioning and invariable compliance.

Assuming that the pilot will do his best, there remains a responsibility for the designer. With all due credit to the strides that the aeronautical art has made, it must be admitted that vision is still generally unsatisfactory. Engineers and designers *must* give more attention to vision if general commercial flying is to become popular. Vision from an airplane in flight is not a luxury or a secondary consideration. It is of prime importance and the basis of all safe operation, for unless we can see our dangers we certainly cannot be expected to avoid them. Vision should be greatly improved, and must be, even at the sacrifice of other factors, if progress is to continue.

//

Common Sense and Selling

THERE HAS BEEN much loose talk in the aviation industry about the selling of airplanes, with the general theme that all the industry needs to do is to develop an "efficient" sales organization and "cultivate the market" in order to dispose of all the airplanes that can be produced. It is hardly necessary to point out that the electric refrigerator industry might devote a vast amount of money and effort to the cultivation of sales in Greenland without material result.

Certainly in selling airplanes we might as well admit

at the start that some airplanes cannot be sold to anyone and that some people will not buy any kind of an airplane, regardless of price or merit. Assuming an extreme of pessimism, it is conceivable that there might be no immediate market of any material importance for any sort of an airplane. As a matter of fact it must be admitted that the market is very definitely bounded as to types of planes and as to groups or social classes from which the purchasers can be drawn. While we may not be able to predict how many planes or exactly what types of planes these groups will purchase, we can definitely rule out at the start everyone outside of our groups of possible purchasers, and every plane not suited for sale to one of these groups, so far as commerical production and sale are concerned.

Without attempting any extensive analysis, it is almost self-evident that there are four main groups purchasing aircraft. They are: individuals financially able to buy for sport or personal travel, individual business firms buying planes for their own uses, transport lines, flying schools, or miscellaneous "aerial service" operators. The only planes which can be produced commercially are those which fill the requirements of buyers contained in the four groups given above. Concurrently, all sales efforts should be directed to those groups, and allocated among them with some discrimination. Any effort to sell planes in commercial quantities to the private owner must still be speculative, a planting of seed for later harvest. A new habit will have to be developed in a large section of the community,—which takes time. Few individual builders of aircraft, however brave and ambitious, and patriotic they may be, can afford to stake everything in the immediate future upon the success of a one-man campaign for the private purchase of aircraft. "Diversification" is a slogan the value of which is not limited to the bonanza wheat farmers.

//

Private Flying Clubs

FOR SEVERAL YEARS now Americans have been observing with admiration and envy the provisions made in various parts of the British Empire for permitting private flying sport upon the most reasonable financial terms. The light plane clubs, fostered by the government of Great Britain, and subsequently by most of the British Dominions, have provided for the activities of some thousands of pilots who would have had to relinquish all hope of flying on other terms.

The British Empire has no patent on this scheme. Although there is not the remotest prospect of duplicating in the United States the subsidies which the British and Dominion governments have provided, those have not been large enough to be necessarily decisive. The basic principle should work as well upon American soil as in Canada or Australia. The plan of divided ownership of an airplane by a group of people who are financially unable or for some other reason unwilling to become individual owners ought to have taken hold in America before now.

For some reason it has not done so. There is a great deal of talk about flying clubs, but comparatively few of them are actually flying. The plan of the National Aeronautic Association and that of the Aviation Country Clubs, the two most pretentiously organized on a national scale, have both been very slow to extend their scope. Individual clubs detached from any national organization have in most cases, although not in all, sailed a troubled sea of inexperienced management and of inadequate financial protection against mishap, and many have been wrecked in the early stages of their voyage.

For the private flying club enthusiast who looked only backward the prospect would be more than glum, but we do not despair of the future. We believe that the club idea is fundamentally sound, at least as a means of helping private flying as a sport through its early stages. We believe that this country can support at least five hundred genuinely active and self-sustaining clubs. We hope to see them formed and operated under proper conditions.

As in all other aeronautical activities, it is folly to rush ahead without recognition of facts. Clubs cannot be organized on a song. They are not going to run themselves. If they attempt to get along without insurance, they are taking a chance no group of business men ought to assume, and they are sowing the seeds of recrimination and internal dissension. The greatest obstacle to the formation of flying clubs has been the individual, self-deluded or led astray by professional optimists, who vaguely fancies that it ought to be possible to fly for an aggregate cost of about $2 an hour and throws all possibility of accident out of his reckoning.

There are a great number of would-be pilots who have no desire to go into flying as a profession, and who at present refrain from taking instruction because they see nothing of interest at the end of their school course. There are many already qualified who have reluctantly abandoned their aerial practice. They need the flying club, and we know no other device that can serve their interest in the same fashion. The industry needs the flying club as a means of promoting the use of its products. It needs it desperately. Manufacturers of aircraft, dealers, operators of schools, and all those whose future depends upon the increasing of public interest in personal use of the airplane should do everything in their power to put an added drive behind the organization of clubs on a national scale, and under enough central control to insure some safety and sanity in their operation. The National Aeronautic Association and the Aviation Country Clubs, as well as any other organization which may unselfishly undertake to promote club flying upon reasonably intelligent lines, deserve not only the aircraft industry's sympathy but its whole-hearted and active support.

REGULATING *Air Commerce*

ARTICLE I— INSPECTION

By J. S. Marriott
Chief, Inspection Service, Aeronautics Branch, Department of Commerce

THE INSPECTION SERVICE is the field organization which is responsible for the operation of the licensing and air regulation program Its duties include the examination and licensing of pilots, mechanics, ground school instructors, and flying school instructors, and the inspection and approval of airplanes, factories, flying schools, and repair stations In addition, it is charged with all field work in connection with the investigation and reporting of aircraft accidents and the enforcement of the Air Commerce Regulations and Air Traffic Rules. The activities of the Inspection Service are directed by the Chief of Inspection Service and his two assistants, H. F Rough and E A Cutrell

The administrative work of the Inspection Service is divided into nine districts with a supervising aeronautical inspector in charge of each district There is an office centrally located in the area for which each supervisor is responsible Fig 1, shows the division of the United States into the nine inspection districts

The names of the nine supervisors, with the addresses of their district offices, are as follows G E Gardner, Dept of Commerce, Roosevelt Field, Garden City, L I, N Y. C A Charles, Central Airport, Camden, N J Leo C Wilson, Municipal Airport, Atlanta, Ga R D Bedinger, 607 Free Press Building, Detroit, Mich G W Vest, Municipal Airport, 5932 South Cicero Ave, Chicago, Ill R H Lees, Jr, Room B, Chamber of Commerce, Kansas City, Mo H B Pentland, Army Airways, Love Field, Dallas, Tex E E Mouton, Oakland Airport, Oakland, Calif W F Parkin, 627 Chamber of Commerce Building Los Angeles, Calif

BESIDES the Washington office personnel and the district supervisors, there are 38 aeronautical inspectors, 8 aeronautical engineering inspectors, 4 aeronautical school inspectors, and 16 (factory) airplane inspectors

With the exception of the (factory) airplane inspectors, all of the above inspection personnel are pilots with years of experience Men who on account of the nature of their work must not only possess a thorough knowledge of airplanes and airplane construction and above the average ability as a pilot, but also sufficient tact and diplomacy to properly meet the public and carry out the work of examining pilots and mechanics, and of inspecting aircraft in the field The airplane inspectors stationed at the various aircraft factories are selected for their intimate knowledge of structural details in the manufacture of aircraft and are not necessarily pilots Over 80 per cent of the aircraft production is now covered by (factory) airplane inspectors, which means that all such aircraft leave the factory already inspected, licensed and ready for commercial operation

The efficient and satisfactory regulation of air commerce is a gigantic task which has been handled by the Aeronautics Branch since the passing of the Air Commerce Act in 1926 Although handicapped by limited appropriations and a shortage of personnel, the Branch has expanded rapidly to keep pace with the growing industry AVIATION *welcomes this opportunity to present in six articles the activities in connection with the regulatory work of the Branch, headed by Gilbert G Budwig as director of Air Regulations They come with unimpeachable authority over the signatures of the chiefs of the several sections concerned. The first article deals with that all important item of inspection The second article which will appear in next week's issue, has been written by Kenneth M Lane, who tells about the organization and work of the Engineering Section of which he is chief.*

The Department of Commerce aircraft inspection districts of the United States

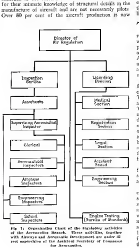


Fig 1: Organization Chart of the regulatory activities of the Aeronautics Branch. These activities, together with Airways and Aeronautic Development are under direct supervision of the Assistant Secretary of Commerce for Aeronautics.

THE AERONAUTICAL INSPECTORS examine pilots and mechanics and inspect airplanes for original as well as renewal of licenses They investigate accidents, examine witnesses in connection therewith, and file complete reports giving as accuratly as posible the cause of the accident They report violations of the Regulations and Air Traffic Rules and recommend the penalty to be assessed, they are even authorized to lift the license of an airplane or pilot if the violation is serious enough to warrant such action

The engineering inspectors inspect and test in actual flight all new types of aircraft to determine their eligibility for an approved type certificate, or for license These men of necessity must be exceptional pilots and in addition possess a knowledge of aeronautical engineering Theirs is indeed a romantic phase of the work, putting new models through their paces under all loading conditions, testing them for performance, balance, stability, maneuverability, and recovery from spins On several occasions, factory test pilots working with the engineering inspectors on the tests of some new or radical type have had to leave the plane by parachute in order to save their lives In addition to testing the plane itself, the engineering inspector inspects the factory for facilities workmanship and material.

Recently, the Department provided in the Regulations for the approval of airplane repair stations The inspection of these aircraft repair and service stations will also be done by the engineering inspection personnel

Aeronautical school inspectors are responsible for the examination of the instruction personnel of the aviation school, both the flying instructors and the ground instructors, as well as for the inspection of the equipment and facilities of the school itself The school inspection work is relatively new, the amendment to the Air Commerce Act of 1926 authorizing the inspection of flying schools when such schools apply was only passed Feb 28 1929 However, quite remarkable and thoroughly gratifying results have been accomplished since that time. At the time of writing, 24 schools have been issued approved

school certificates and the whole trend of flying instruction has improved materially, which should assist the industry by providing adequately trained pilots and help to eliminate accidents chargeable to errors of personnel

Perhaps one wonders how the aviation public knows where to find an inspector when an inspection, examination, or license is needed And let the writer add right here that the inspector is always wanted in a hurry.

The present system for contact and communication is as follows Each supervisor's office prepares for each

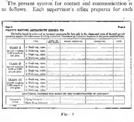


Fig 2

month in advance The supervisor lays out an itinerary or route schedule for each of the men he has available, covering the centers of aviation activity in the area for which each inspector is responsible He then makes up this itinerary list showing the places at which an inspector will be available each day for the ensuing month These notices are mailed to all airports and aviation authorities in the district and copies sent to all parties for whom the district office has an application for license This enables the applicant to contact an inspector at the time and place most convenient to himself It enables anyone, who desires the service of an inspector, to go to any airport, look at the bulletin board and see where inspectors are on this day In most instances, a flight of 50 or 100 miles at any time will put anyone in personal touch with a representative of the Department

In the past it has been customary for applicants to mail their applications to Washington Upon receipt they were checked for completeness and forwarded to the district office The Inspection Service, in order to expedite the issuance of licenses, would now prefer that all applications be presented directly to an inspector or mailed to the district office instead of to Washington This will result in less handling of applications and eliminate delays and correspondence resultant from improperly executed applications

On Dec 1, 1929, the Inspection Service commenced examining pilots on the basis of the new pilot's classification This classification requires that all passenger carrying grades of pilots hold a rating for the weights and types of aircraft in which they desire to carry passengers for hire. New types of pilots' licenses have been prepared to take care of this work. A transport or limited commercial pilot's license will consist of the license itself giving the holders personal identification data, plus the Rating Authority Sheet, which when properly endorsed by an inspector, will permit the holder to carry passengers for hire in only the types in which he is qualified The various ratings for the different weights and types of aircraft are shown on the sample form (Fig II)

A sample of a transport license to which this Rating Authority Sheet will normally be attached is shown in Fig III For the pilots now holding federal licenses, the new type license will be issued at the time of renewal with a suitable letter of instruction directing the pilot to contact an inspector for the purpose of obtaining his rating authority by a demonstration of ability in the classes of aircraft necessary for the type of commercial operation in which he is engaged

The new pilot's license is perhaps the most important step that has been recently undertaken in connection with air regulation work It is hoped that it will make the pilot's license of greater value to the pilot himself, and give the flying public further assurance that he is qualified to fly the type plane being operated

The enforcement of the Regulations, while it is a distinct and important duty of the Inspection Service, is at the same time somewhat of a problem This is true because it is also the function of this organization to promote commercial aviation Therefore, regulations should not be so strict that the growth of the industry will be retarded Yet at the same time, they must be strict enough to protect both the industry and the public consumer of aeronautical products and services

Obviously, with the limited personnel of the Inspection Service, it would be impossible to obtain compliance with the Regulations, and particularly the Air Traffic Rules, by a strict surveillance and rigid enforcement method It has never been the intention of the Aero-

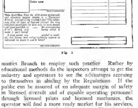


Fig 3

nautics Branch to employ such practice Rather by educational methods do the inspectors attempt to get the industry and operators to see the advantages accruing to themselves in abiding by the Regulations If the public can be assured of an adequate margin of safety in licensed aircraft and of capable operating personnel through licensed pilots and licensed mechanics, the operator will find a more ready market for his services, and the manufacturer for his product Therefore, the Inspection Service assists the industry by an attitude of cooperation for the promotion of aeronautical activities and at the same time endeavors to obtain compliance with regulations which are in effect to protect the public and improve the safety of operation of aircraft with ultimate beneficial results, both to operator and consumer.

Aircraft Demand

PAST, PRESENT AND FUTURE

By Robert R. Doane

With aeronautic production and sales at a low level, there is no better time than the present for an analysis of past sales and market demands, with a view toward forming some sort of a guiding estimate relative to future volume of consumption. ¶Mr. Doane has attempted such an analysis. He deals in considerable detail with such matters as increased civil and commercial consumption since the war period, major factors of new demand and distribution, the element of price, and the replacement demand, etc. ¶Although there may be those who will not agree with Mr. Doane's methods of deduction, his assumptions, and the figures he presents to substantiate his views, the analysis is both interesting and informative and can be taken as an outline along which the individual manufacturer can work out his own particular plan of procedure during the new year.

In AVIATION as in all other lines of industrial effort the past is the more informative, the future the more interesting, while the present remains ever the most obscure To understand the present position of the industry we must know something of its productive history—how it has reached its present point, the general nature of its market, its ability on the supply side, and what major forces are working toward its further development

The aircraft industry has had no sudden spontaneous growth all other impressions to the contrary It has developed over a long period of time and has been but the result of natural engineering evolution in line with the swiftly changing conditions of our time

Yet in no section of American industry do the prospects for the coming few years appear to hold so much confusion and uncertainty as in the future course of aviation today The discussion of the various points of view seems to have proceeded with little reference to the basic facts concerning the industry's major problems Some of these facts have been presented in such contradictory and unorganized confusion as to preclude the possibility of comparative meaning or clear analysis

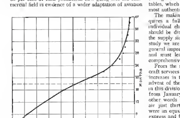
Those who are acquainted with the recent course of aviation know that by all odds the most important facts regarding its advance are the impressive increases in the air transport and air mail services, coincident with the unprecedented output of commercial planes during recent years No other facts will help so much in understanding aviation's present situation

Table I gives a picture of the productive output and the rates of growth of the industry during the past ten years From 1920 to 1929 the total increase in production has been 1,200 per cent This is equivalent for this period, to an annual average rate of increase of 37 per cent compounded With the exception of 1921 and 1922 the growth has been constant, ranging from 34 4 per cent to 117 4 per cent per annum It is evident from Table I that the industry's output over this ten-year period has been some 13 593 planes, and that of this total number over one-half (56 8 per cent) have been produced during the past 18 months It should not be difficult to grasp the significance for the future of this tremendous acceleration in current aircraft consumption

The popular impression that aviation is to become another of our great industries seems thus to be fully borne out by the facts. From the standpoint of productive output its growth has been large even though we eliminate the rapidly mounting peaks of recent years From 1909 to date—a period of 20 yr—production has shown a persistent annual increase singularly stable and at a rate in excess of 34 per cent per annum

Table II, compiled by the Aeronautics Branch,

Department of Commerce, with the exception of the Civil sub-classification from 1925 to June 30, 1929, illustrates the major divisions of aircraft distribution The significant change from 80 per cent of the total annual output going to the Government in 1920 to approximately 80 per cent of total production now going into the commercial field is evidence of a wider adaptation of aviation



Airplane survivor curve. The proportion of planes produced in any period which will remain in use in succeeding periods.

on the part of the general community These distributions are based on total numbers of planes. Owing to the higher unit cost of military planes, production for military use is still about half the aggregate value

Before taking up the factor of replacement a glance at Charts 1 and 2, here reproduced, vividly displays this solid foundation of demand underlying the industry, fully 62 per cent of which it appears, can be confidently looked upon as stable continuous annual demand. The evidence upon which these inferences rest is to be found through an analysis of the accompanying charts and tables, which represent, so far as the writer knows, the most authentic records available

The making of a careful analysis of distribution requires a full appreciation of the general nature and individual character of the market. Such an analysis should be directed always at both sides of the market, the supply side and the demand side However, in this study we are first concerned with trying to arrive at a general impression of the market's underlying character and must leave its more detailed analysis to a more comprehensive special study.

From the standpoint of a wider public usage of aircraft services the outstanding fact has been the significant increases in the use of the airmail, especially since the advent of the private operating company. The increase in this division has been 3,000 per cent during the period from January, 1926, to the end of August, 1929. In other words the community is now forwarding via the air just thirty times more mail per month than they were an equal number of months back The increase in express and freight shipped by air has risen from a few thousand pounds in 1924 to a total monthly sum in excess of 200 000 lb., according to official Department of Commerce reports Also in number of passengers carried, exclusive of field or airport novelty hops, the increase has been even more substantial

In order that we may picture the full extent of the total use of aircraft for commercial purposes today we can best arrive at an estimate by adding the three divisions of mail, express and passengers in terms of pounds carried For these combined, the total monthly volume approximates 1,998,055 lb , or nearly 1,000 tons of paid transport service through the air monthly The total for 1929 will probably greatly exceed 24,000,000 lb.

Table 2.—Comparative Annual Aircraft Production and Consumption Totals

	Total Annual Aircraft Production. Note.—These tables do not include planes engines or parts under construction at end of each year **					Annual Foreign Trade (d) Exports			Imports	Annual Aircraft Consumption In Units (f)			
Year	Total Planes Produced (a)	Rate of Increase Per Cent	Dollar Value (b)	Parts (b)	Total Value Planes, Engines and Parts (b)	Engines and Parts	Planes	Total	Total	Gov't	Civil	Export	Total
1920	328		(e)$5 020 000							263		65	328
1921	302		(e) 4 107 200							389		48	*457
1922	302		4,133,108	$2,331,394	$6,464,502	$338,500	$156 630	$494 930	$19,097	226		37	263
1923	597	94 3	7 737 069	4 065,558	11 802,627	124 507	369 051	433,558	210,172	695		48	†743
1924	(c)					385 535	412,738	798,273	85 992	318		59	377
1925	789	34 4	6 673,650	4,673 075	11 346 734	272,377	511 782	783 659	156 434	447	262	80	789
1926	1 186	50 3	8,071 027	5,075 109	13 946,136	724 061	503 149	1 027 210	77 641	532	604	50	†1 186
1927	1,995	80 3	14 504 999	6 656,954	21 161 953	1 055 015	848 568	1 903 583	158,370	621	1 311	63	1 995
1928	4 346	117 8	38,995 509	25 666,982	64 662,491	1 905 070	1 759 653	3 664 723		857	3,327	162	4 346
1929	*3,581		*23 695,472	*31 289 000	*54,974 472	*1 883 707	*3,290 949	*5,174 656		*527	*2,655	*199	*3 381

*Six months ending June 30 1929

(a) Air Commerce Bulletin. Aeronautics Branch U S. Department of Commerce Vol 1 No 5 September 2 1929 p 6.

(b) Census of Manufactures and Domestic Air News.

(c) Figures for 1924 not available The Census of Manufacturers was taken at five year intervals prior to 1919 but has since been taken at two-year intervals The census of the Aircraft Industry for 1926 was a special one.

(d) Commerce Reports, Aeronautic Trade Division.

(e) Estimated.

*Consumption apparently exceeded domestic production.

**In order to avoid possible duplication the total value of planes engines and parts, as published in this table, is exclusive of such units under construction at the end of each year

(f) Air Commerce Bulletin Aeronautics Branch U. S Department of Commerce. Vol 1. No 5 Airplane Consumption 1919–1928, p 6.

The addition to the 1 186 planes produced in 1926 by the manufacturing industry proper various air service operators produced 150 additional new planes Similar data for subsequent years has not been secured

According to the Department of Commerce estimates there has been produced since 1929 in the United States 30 650 planes of which according to September 1, 1929 figures, there were 9 333 licensed and identified planes in operation

It will be noticed that from 1925 to June 30, 1929 out of a total production of 11 657 planes 7 850 have gone into civil use. This represents 68% of the total production to this source.

The Aeronautical Chamber of Commerce estimates fully 50% of all planes now in operation are in civil or commercial use.

Table II.—Major Divisions of Aircraft Distribution

(In Number of Planes, 1919–1929)

		Government						Civil or Commercial (1)						Estimated
Year	Total Annual Production	Army	Navy	Post Office	Dep ts	Total Gov't	Export	Training Schools	Business	Pleasure	Private	Air Mail Routes	Total Civil	Total Planes in Operation
1919	780	409	273	13	0	695	85							
1920	328	214	42	7	0	263	65							743
1921	437	336	53	0	0	389	48							748
1922	263	187	39	0	0	226	37							763
1923	743	512	175	8	0	695	48							1 647
1924	377	241	76	1	0	318	59							1,057
1925	788	232	213	2	0	447	80	130	91	26	15		262	1,413
1926	1 186	315	163	52	2	532	50	241	211	60	23	69	604	1,928
1927	1,995	241	368	0	12	621	63	598	498	131	65	59	1,311	3 150 (a)
1928	4,346	415	432	0	10	857	162	1,535	1 164	332	166	140	3,327	6,326 (a)
1929	*3 381	527				527	199	1 197	929	265	132	132	2,655	8,333 (a)

Note The following Table has been compiled from a survey of American airplane production, consumption and export, based on such governmental statistics as are available, as compiled by the Aeronautics Branch of the Department of Commerce.

The subdivision under Civil or Commercial classification has been supplemented in accord with a percentage analysis made of commercial aircraft consumption by the Travel Air Company, and may be considered in the absence of more specific data, as a fair proportionate division of this market.

The annual production does not account for planes produced complete or partially from war surplus parts by air service operators throughout the country According to the Air Commerce Bulletin, of the war surplus there were resold by the Army some 1 500 planes and 12,144 engines to the end of 1927, with parts sufficient to make 500 more planes The Navy sold a negligible number of war surplus planes and 750 engines.

(1) Major sub-divisions under this classification have been arrived at by a purely empirical method with the exception of air-mail transport planes The commercial totals are Department of Commerce figures

*Six months ending June 30 1929 Aeronautical Chamber of Commerce

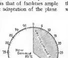
(a) All planes are now licensed or identified by the Department of Commerce, with monthly reports to Air Commerce Bulletin

The above commercial aircraft market may be divided as follows

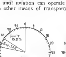
1 Training schools	40%
2. Business purposes.	35%
a. Photography, b. Dusting crops, c. Advertising, d. Newspaper work, e Air taxi service, f Oil fields, g Mining and lumber	
3 Air Mail Routes	10%
4. Pleasure and sports	10%
5. Private interests	5%

Table IV shows the annual increases in the various divisions of aircraft public services It will be seen that the average annual rates of increase are constant, and for the near future at least a continuation of these increases is to be expected

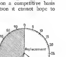
If there is any single element in the industry that is showing any tendency to lag it is that of facilities ample to care for an increasing public adaptation of the plane Mileage of lighted airways has progressed at a steady rate, as have lighted intermediate fields But impressive as have been the figures for established airports these do not appear to be keeping adequate pace with other advancing factors.



Major Character of Total Demand



Major Divisions of Total Demand



Major Elements of Continuous Stable Demand

On the subject of number of licensed pilots, although a problem, it should not long be a serious one. One is here reminded of how ridiculous it would have been, during the earlier period of railroad development, to have spoken of a possible limitation of their advance because of their inability to recruit and train a sufficient number of engineers to man the engines.

It is clear from a study of the figures reproduced below that the average cost per plane has been almost cut in half during the past decade From 13 6 thousand dollars in 1921 and 1922 to 7.0 for 1929 evidences a manufacturing mastery of this factor which argues well for the industry

Average Plane Price Ratio in Thousands of Dollars

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13 6	13 6	13 1	[illegible]	8 4	7 5	7 2	8 9	7 0

With the improvements in the industry's organization now under way, additional economies will doubtless be affected which in large amount will be passed on to the consumer Another factor which seems to be working in favor of a wider distribution program

From the standpoint of revenues for the services planes may render the community as a public utility, there seems to be much labored discussion The argument is heard that until aviation can operate on a competitive basis with other means of transportation it cannot hope to achieve any large measure of success The exponents of this point of view should not overlook the fact that in economic experience the world has always paid for increases in time elimination, and that it is quite likely to continue to do so Such arguments would appear to be fallacious and miss the point of aviation's advantage entirely

It would appear from the evidence at hand that the main reason the utilization of planes has not increased more rapidly, although it is difficult to see how it could have increased much more rapidly than it already has, lies in the public's willingness or unwillingness to accept and utilize its services in ever larger amounts accordingly as it is conditioned by confidence rather than price

On the supply side, competition, which has resulted in

the weeding out of the inefficient producer, has and will continue to take its toll The larger concerns will leave no stone unturned as they tighten their belts for battle against the parasites infesting the industry Likewise, large-scale combination will result in stabilization of production and prices and tend to smooth out the peaks and valleys of output, which must inevitably prove highly beneficial

Now that the structure of the industry is being more or less completely remodeled, in every branch, on basically sound business lines it seems destined to achieve a success of considerable magnitude At least such would be the expectation This fusion of engine manufacturer, plane designers, aero equipment concerns combined with the welding together of parts manufacturing units, such as producers of carburetors, magnetos, etc., which cater co-jointly to the automotive as well as the aeronautical trades, assures quantity production advantages, large-

Table III.—Percentage Analysis of Changes in Distribution, 1920-1929

				Civil or Commercial				
Year	Total Production	Government, Per Cent	Export, Per Cent	Training Schools, Per Cent	Business, Per Cent	Private and Pleasure Per Cent	Air Mail, Per Cent	Total Civil, Per Cent
1920	320	80	20	....	....	....	....	....
1921	437	89	11	....	....	....	....	....
1922	263	85.9	14.1	....	....	....	....	....
1923	743	93.5	6.5	....	....	....	....	....
1924	377	84.3	15.7	....	....	....	....	....
1925	789	56.6	10.1	16.6	11.6	5.1	....	33.3
1926	1,186	44.8	4.2	20.3	17.7	6.9	6.0	50.9
1927	1,995	31.1	3.2	29.9	23.1	9.8	2.9	65.7
1928	4,346	19.7	3.7	35.3	26.7	11.4	3.1	76.5
1929	*3,301	*15.5	*5.8	*35.4	*22.5	*11.7	*3.9	*76.5

*First six months of 1929.

scale savings in the purchases of the highest grade materials so essential to aircraft manufacture, and vast savings in operating costs, which unquestionably represents greatest forward step in the history of the industry.

None can doubt but that the past three years have proven outstanding progressive and apparently prosperous years to aviation On a record combined output of over four thousand units in 1928 and what approximated six thousand units for 1929 the leading manufacturers will shortly report very favorable income statements despite the recent over-expansion so visible in the industry

There are rumblings within the fold to the effect that considerable doubt exists as to the probability of a continuance of the same rate of productive output as that realized over the past few years It can not yet be said that production is entirely regulated by demand as indicated by a close analysis of the major character of domestic consumption It can be readily seen in Table I that during the last half of the decade here under observation the so-called "civil" or commercial demand has consumed fully 68 per cent of the total output It is this commercial demand which just now seems to be causing most of the devilment

Granting the truth of these assertions, there still remains a large element of doubt as to whether, in its essential characteristics, domestic aircraft demand may not continue to undergo marked change.

Nothing can be of more importance in clarifying this atmosphere than a true knowledge of the major elements

Table IV.—Utilization of Aircraft Services

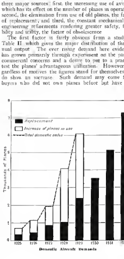
Year	Pounds of Mail Carried	Rate of Increase	Passengers Carried	Rate of Increase	Pounds Express Carried	Rate of Increase	Miles Flown Air Trans.	Rate of Increase
1926	705,310	203	5782		1 733 092	....	4 698,880	....
1927	1,452,426	106.5	8,679	50.1	2,307 579	33.1	5 242,839	....
1928	3 542 074	143.9	49 713	472.9	*2,147 981	....	10,472,024	....
1929	**3 400 000		**40 000		**1 200 000	....	**8,000,000	....

*Does not include miscellaneous freight flown by special order.
**Six months ending June 30, 1929

which to the practical business man constitutes demand In Table I, under total consumption the classification is rather broad being divided among Government, Civil, and Export In Table II the classification is further refined into its main constituent parts in order that the major divisions may be studied as to their individual trends, their evidence of constant growth, as well as to a certain stability which may be looked to in the future Now we shall eliminate this classification and attempt to study the more fundamental elements behind the whole of this demand.

The domestic demand for aircraft can be traced to three major sources first the increasing use of aviation which has its effect on the number of planes in operation; second, the elimination from use of old planes, the factor of replacement, and third, the constant mechanical and engineering refinements rendering greater safety, flexibility and utility, the factor of obsolescence

The first factor is fairly obvious from a study of Table II which gives the major distribution of the annual output The ever rising demand here evidenced has grown primarily through experiment on the part of commercial concerns and a desire to put to a practical test the planes' advantageous utilization However, regardless of motives the figures stand for themselves and do show an increase Such demand may come from buyers who did not own planes before but have just



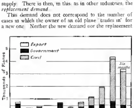
Domestic Aircraft Demands

entered the aircraft group, or buyers who previously owned one or more planes but who now have augmented this number In one way or another these buyers have accepted more airplanes as a part of their going equipment This can be called the *new demand* for new planes but new only in the sense that it comes from new uses by old owners or by an extension of the number of users

The second factor does not involve a change in habits of aircraft consumption On the contrary, it arises from the fact that when a buyer has once accepted the airplane he does not easily give it up, and thus is implied a certain stability of aircraft consumption habits

This fact, combined with the obvious fact that planes do wear out, or for other reasons are eliminated from use as planes gives rise to an ever growing annual demand for new craft to maintain intact the country's supply There is then, in this as in other industries the *replacement demand*

This demand does not correspond to the number of cases in which the owner of an old plane "trades in" for a new one Neither the new demand nor the replacement



Major Division of Aircraft Consumption 1919 to 1929

demand can be earmarked and identified with particular planes coming from the manufacturers. The two types of demand can, however be measured with considerable precision, and through such measurement prediction of the future demand is facilitated

Obviously during the early days of an industry practically all of the demand will be of the "new" type This does not imply that the struggle in converting buyers to the use of aircraft is over—but it does mean that its adoption has already gained such proportions and momentum that the replacement demand is now at the stage where it will begin to play an ever increasingly important part As the number of planes in use has increased, and the planes have become older, the number eliminated each year has increased and hence this type of demand has grown until it now undoubtedly accounts for fully one-third of the total demand A statistical study, therefore, of the rate of this elimination becomes important to the industry

As a further guide to the importance of this factor to the industry, aside from its stabilizing qualities on the demand side, it should be pointed out quite clearly that this replacement demand for aircraft was greater in 1924 than was the total aircraft production for 1921 and 1922 It was far greater in 1927 than was the total production in 1925 and in 1928 was equal to the total demand and output for all of 1926 For this year, 1929, the replacement demand alone will aggregate more than the total annual output of the years 1924, 1925 and 1926.

Table V.—Aircraft Facilities

Year	Airports	Lighted Intermediate Fields (1)	Mileage of Lighted Airways	Flying School	Pilot Licenses	Student Permits
1926		92	2,041	175		
1927	503	134	4 468	375		
1928	803	210	6,958	475	4 887	4 935
1929	*830	*281	*13 000	*575	**7 466	5 766

(1) Includes Municipal Commercial and Private.
*To July 31 1929 **August 30 1929

The analysis of this factor of the demand for aircraft proceeds somewhat as follows the number of planes consumed in this country every year over a definite time period are easily deduced from the authentic annual production figures plus imports and minus exports If, now, we know the normal mortality rates, we can combine these with the past domestic sales to determine the number which should normally be eliminated in a specific period In other words, we create a complete normal mortality curve for airplanes comparable to those for human lives used by insurance actuaries From this may be deduced comprehensive expectancy tables similar to those employed by railroad companies in estimating cars needed in advance of seasonal requirements, telephone companies in estimating raw materials and equipment needed in advance and so on down through the entire list of our intelligently managed industrial enterprises

During the past 10 years of the industry's history there have been produced for domestic use some 12 823 planes On Aug 31, 1929, according to the Department of Commerce reports through licensed and identified planes, some 8 333 are accounted for There may have been some planes in existence at this time which were not accounted for but it is reasonable to believe that this number would not exceed 10 per cent Not a large enough figure to endanger the validity of this study It is therefore obvious that some 4 500 planes have ceased to be used as such and have therefore been eliminated from the Nation's supply

It should also be clear that of the approximate 4,500 planes eliminated they were not discarded all in any one month or year, but rather over a considerable length of time and the elimination was more or less gradual in its process In the absence of any official data on this sub-

Table VI—Method of Determining Annual Rate of Elimination

Year	Total Number of Planes in Use	Total Domestic Production (1)	Obvious Planes Carried Over (2)	Obvious Replacement (3)	Normal Life Table Estimated Replacement (4)	Per Cent of Error (5)
1925	1 253	709	544	513	439	14.4
1926	1 920	1 116	782	471	469	0.4
1927	3 150	1 912	1 238	860	782	8.1
1928	6,320	4 184	2,136	1 014	1 104	13.4
1929	*8,333	**3,182	5,151	**1 169	1 174	0.4

(1) Total annual production less exports.
(2) Obtained by subtracting total new production from total number of planes in country
(3) Obtained by subtracting planes carried over from total number of planes in country in previous year
(4) See Table VII
(5) Percentage of error between estimated and obvious replacement.

Table VIa—Supplemental Table

Year	Total Number Planes in Country	Increase of Planes in Use	Domestic Production	Planes Replaced
1929	8,113	2,013	3 182*	1 169*
1928	6 320	3 170	4 184	1 014
1927	3 150	1 150	1 932	782

*Six months only

ject it is the purpose of this study to arrive at some approximation of this periodic percentage elimination.

THE GRAPHIC STUDIES here produced of these deductions are found to correspond fairly accurately with actual statistics on growth of domestic production and licensed and identified planes now operating within the country Their relationship is clearly shown in Table VI

The Survivor Curve should show, of a given number of planes starting life, the number that will drop out at the end of each succeeding time period until all of the original number has disappeared from service

The first problem in a study of replacement demand is to determine this mortality curve It is clear that we cannot conveniently tag each plane and follow it individually through its life any more than in the construction of life insurance expectancy tables the 100,000 new born individuals could be definitely traced year by year until the last surviving one-hundred-thousandth passed out of existence

We can, for example, definitely find the number of planes obviously one year of age in 1927 and the number two years of age in 1928 It will also be clear that the latter number will be smaller than the former and that the difference between the two will give us some measure of the mortality between one and two years and so on

Example:	1926	1927	1928
Domestic consumption	1 136	1 932	4 184
One year of age	709	1 136	1 952
Two years of age	359	709	1 136
	2,204	3,777	7 252
Official number accounted for	1 928	3 150	6,520
Number eliminated	276	627	952
Number of planes 2 yrs. remaining	85	82	204
Percent eliminated	76	88 6	82
Average two year mortality rate, per cent			82.1

The above could be divided, if monthly production figures were available, into quarterly and monthly figures for purposes of greater accuracy If this operation be repeated for each possible age period we will then have the basis for a mortality curve as illustrated in Chart 3. [These data are of course based in the first instance, as a necessary simplification, upon the assumption of a uniform life for each plane Actually, part of the eliminations would be among planes a year or less in service, while other machines would survive much more than two years, as indicated by the author in Chart 3, which is a probability curve built up around the average life determined as just shown —Ed]

Highly synthetic as such method may at first appear, yet it represents the best available manner of determining a ready solution and in results will supply an accurate approximation for all practical purposes As a further test of its validity, both from a study of the obvious annual displacement as well as from the comparative figures in the table it will be seen that the percentage of error is astonishingly small, never exceeding 15 per cent, whereas in the established tables now used by insurance companies this percentage of error fluctuates within a 20 per cent range

It may be argued that the great improvements of recent years in aircraft construction have lengthened the life period of its service. But it must be kept in mind that the outstanding conditional factor governing plane mortality is functional, and is bound up with the engine and mechanical elements From reliable engineers' reports the annual engine depreciation is given at 35 per cent, and depreciation for the plane is 33⅓ per cent

Table VIII—Estimated Normal Annual Elimination

The following table is made up by applying the percentages of annual elimination as given in the Normal Life Table to the actual known production of previous years. In the light portion we are dealing with known quantities whereas in the shaded portion we are necessarily dealing with an estimated annual domestic production based upon the average normal rate of increase which is subject to fluctuation

Year	Domestic Production	1925	1928	1927	1928	1929	1920	1931	1932	1935	1934
1934	32,472										
1955	23 155										6,057
1932	16 465									4,297	9 220
1931	11 795								3,054	6,555	1,344
1950	6,305							2,167	4 650	1,096	224
1929	5 077						1,551	3,291	775	158	117
1928	4,184					1 092	2,345	552	112	83	
1927	1 932				504	1 081	215	32	38		
1926	1 136			296	636	149	50	22			
1925	709		185	597	95	19	14				
1924	559	95	201	47	9	7					
1923	539	101	71	37	10						
1922	265	54	7	5							
1921	254	6	5								
1920	263	5									
Annual Totals		429	469	782	1 252	2 348	4 375	6 084	8,629	12,187	17 142

Table VII—Normal Life Table for Aircraft

The following "life experience" study for aircraft is preliminary only and is subject to later revision pending the completion of further researches. While the results here obtained are apt to be found not far from the actual figures, yet the exact percentage elimination for the middle periods are subject to some modification.

1 Age in Months	2 Number of Planes Surviving	3 Per Cent of Planes Surviving	4 Number Eliminated During Period	5 Per Cent Eliminated	6 Annual Percentage Elimination
0	1,000	100 0	0	0	
2	995	99 5	5	5	
4	978	97 8	17	1 7	
6	935	95 5	43	4 5	
8	879	87 9	56	5 6	
10	812	81 2	67	6 7	
12	739	75 9	73	7 5	26 1
14	665	66 3	76	7 6	
16	505	58 5	76	7 8	
18	501	50 1	84	8 4	
20	349	54 9	152	15 2	
22	249	24 9	100	10 0	
24	179	17 9	70	7 0	56 0
26	120	12 0	59	3 9	
28	91	9 1	29	2 9	
30	77	7 7	14	0 4	
32	65	6 5	12	1 2	
34	55	5 5	10	1 0	
36	47	4 7	8	0	15 2
38	41	4 1	6	6	
40	36	5 6	5	5	
42	52	5 2	4	4	
44	28	2 8	4	4	
46	24	2 4	4	4	
48	20	2 0	4	4	2 7
50	16	1 6	4	4	
52	12	1 2	4	4	
54	8	0 8	4	4	
56	4	0 4	4	4	
58	2	0 2	2	2	
60	2	0 2	2	2	2 0

With the increasing interest in replacement demand, and hence in the average life of the plane, there has arisen considerable opinion to the effect that the life of the plane has been greatly increased of recent years Also, that through technological improvements rendering obsolete perfectly good planes thus shortening the life for this class However, in this case, such planes would be "used" planes and would still appear in the official figures unless completely scrapped This study, however, places the average plane life at 18 months, as may be observed from our chart study of the survivor curve It is the conclusion of the writer that although the quality and durability of planes has greatly improved, as has its safety and security in handling, the average life has remained remarkably stable throughout the past ten years of its development.

Chart 4 clearly portrays how the domestic market has been divided between replacement of planes eliminated and the annual increase of planes in use It will also be noted that in Tables VIII and IX the replacement demand has been indicated up to 1935 on a normal, maximum and minimum basis, allowing for the variable of 15 per cent The high predictability of this replacement demand together with the known Government purchases for the next five years, the normal expectancy of export demand as well as the established rate of the other divisions of demand supplies us with an expectation table both from the standpoint of production and consumption as shown in Tables IX and X

Applying the data in column 6 in the Normal Life Table for Aircraft, Table VII, we may conclude that in 1929 there will drop out of use 26 1 per cent of the planes produced in 1928, 56 per cent of the planes produced in 1927, 13 2 per cent of the planes produced in 1926 and so on The sum of these figures, representing the normal elimination for 1929 is 2,348 The replacement demand thus forecast is the largest in the history of the industry The result, of course, was to be expected, as the number of planes eliminated annually has been increasing because of the increasing rate of production in recent years

On this basis the estimated elimination for the first six months of 1929 is one-half of 2,348, or 1,174 Whereas the actual replacement as disclosed by the latest number of licensed and identified planes shows an obvious elimination of 1,169

It will further be observed that in order for the aircraft industry to continue to produce at approximately the long trend rate it is only necessary for them to find an ever smaller number of users For example, in 1928 for the industry to sell 4,184 planes to the domestic market it was necessary to increase the total number of planes in use to about 3,170 In 1929 in order to sell the same number of planes it will only be necessary to increase the number in use by about 1,981.

Any greater increase in the number of planes used and any increase in the foreign demand which we have not seen in this study analyzed concretely must result in a net increase in the total annual volume of aircraft production. In view of a general increased use of the plane in an ever growing and highly organized industrial nation, with a certain increase in its use for mail, express and passenger transportation, a continued steady growth in the number in use annually would seem to be a reasonable expectation

For purposes of arriving at an approximation of what these annual increases may be Table X, which includes eight varying rates of increases may prove of value. In utilizing the expectation tables here published they may be made to serve to advantage in measuring the probable growth of individual manufacturing and transport companies Should these various organizations be able to maintain their relative position in the industry in point of gross volume of business shared, and through careful management maintain approximately the same percentage of net to gross earnings then the relative market increases in their respective shares for a period of years becomes predictable

In conclusion, it should be remarked that what has been said in this article about the future of aircraft production assumes a reasonable degree of general business stabilization, and thus the continuance of general economic prosperity It is obvious that any forecast of the future which claims to be at all unbiased must be built upon an examination of the past, for unless there be found in these records of previous performance some clues as to what may be found ahead there can exist no available basis upon which to hazard even the vaguest kind of guess In seeking to discover those determinants of aviation's future, the faith confidence, courage and ability of men cannot be left out of account. It is, after all men who make statistics which later serve as the permanent record of their foresight

Table IX—Aircraft Demand Expectation, 1929-1935

Total demand computed on an average annual rate of growth basis of 40%

Year	Replacement Demand: Normal (1)	Replacement Demand: Maximum +15%	Replacement Demand: Minimum −15%	Replacement Demand: Average	New Demand (2): Gov'mt	New Demand (2): Export	New Demand (2): Commercial: Transport	New Demand (2): Commercial: Other Civil	(3) Total New Demand	Total Demand All Sources
1929	2,348	2,700	1,996	2,540	692	207	400	2,457	3,756	6,084
1930	4 175	4,801	3,549	4,175	762	215	667	2,701	4,345	8,518
1931	6,084	6,996	5,172	6,084	812	222	1,067	3,720	5 841	11,925
1932	8,629	9,925	7,335	8,629	902	230	1,112	5 822	8,066	16,695
1933	12,187	14 015	10 359	12,187	972	240	1,142	8,832	11 186	23 373
1934	17 142	19,713	14,571	17,142	1,042	250	1,165	13 237	15 694	32,722
1935	24 085	27,695	20 471	24,083	1,114	260	1,177	19,177	21,720	45 811

(1) Estimated consumption less replacement.
(2) Estimate obtained by subtracting the sum of the average replacement, Government, export and commercial totals from the total estimate in last column
(3) The difference between replacement and total estimated demand.

Table X—Aircraft Production Expectation Table

Rates of Increase

Year	100	75	Present 60	50	Normal 40	Computed 34 67	Decrement* 2	4
1928 Base	4,346	4,346	4 346	4,346	4,346	4,546	4,546	4 346
1929	8,692	7,605	6,955	6 519	6 084	5,852	5 997	5 910
1930	17 584	13,308	11,124	9 778	8,518	7,900	8,156	7 801
1951	34,768	25 284	12 798	14 667	11 925	10,746	10 920	9 586
1932	69 336	40 755	28,476	22,000	16 695	14 471	14 426	12,285
1953	139 072	71 521	45 561	53 000	23,373	10,408	16,753	14 659
1954	278,144	124,811	72,897	49 500	32,715	26,244	24,004	17 237

Range of greatest probability

THE LEHIGH Airports Competition

By Charles F. McReynolds
Pacific Coast Editor of Aviation

A. C. Zimmerman and William H. Harrison Win First Prize with "Quadrant Airport" Design that Provides for Day and Night Operations in Any Wind Direction

Left W H Harrison, right A C Zimmerman

THE RECENTLY concluded Lehigh Airports Competition produced 257 designs and its object was to concentrate the efforts of architects, engineers and city planners of the United States upon the problem of preparing an air terminal plan which would most nearly represent what any ideal air transport field should be General requirements were concerned entirely with developing a land field no consideration being given to seaplane facilities, the field being presumed to be at sea level, on a level site, with an effective landing area of 3 500 ft. in all directions and with prevailing winds presumed to be of equal force in the eight cardinal and quarter points of the compass Paved runways were to be provided in order to handle operations in any of the eight directions, and the effective landing area was to be protected by a margin of 350 ft on all sides providing a seven to one gliding angle from the extreme limit of any runway to a point 50 ft above the extreme edge of the margin Lighting equipment, service and storage facilities, passenger handling arrangements, hotel and restaurant accommodations and other items important to a modern airport, were to be provided for in the design

The winner was judged largely upon the ingenuity with which the various units of the airport were organized in relation to each other, and for the degree of efficiency provided for in the handling of planes and passengers

The winning design, submitted by A C Zimmerman and William H. Harrison, associated architects, is particularly notable for the manner in which all units of the airport are combined, for the provision of a novel system of runways and taxi-ways with plane traffic controlled by colored lights and for the development of a new type of loading point, which completely removes passengers and spectators from any possible unauthorized access to the flying field yet at the same time providing for the rapid loading and unloading of several planes at once The idea of a star shaped loading point with from five

An artist's conception of an air view of the Quadrant airport

Architect's drawing of the front of the passenger terminal of the Quadrant airport

to nine "tunnels," or canopies, extending out to arriving and departing planes from a central circular building which is reached through an underground tunnel from the main administration building was originally conceived during the design of the Western Air Express terminal by A M Edelman and A. C Zimmerman associated architects C. C Cole superintendent of operations for Western Air Express, is credited with much assistance by the designers in the development of this scheme, as well as assisting in the development of the hexagon shaped service hangar now in use by Western Air Express A modification of the loading point idea suggested in the winning design of the airport competition, is now in use at the Western Air Express terminal, Los Angeles, with three "tunnels" radiating direct to planes from the main administration idea and the entire scheme will be developed there as soon as traffic warrants

CONSIDERING the winning airport design submitted by A. C Zimmerman and William H Harrison more from the aeronautical than the architectural standpoint, we find many features of interest It would seem that any airport designed to provide for operations in any wind direction, would of necessity be symmetrical in shape and would logically consist of a circular runway area in the center of a square field, with the unused portions of the field devoted to airport building Such a layout is shown at "A" in Fig 1, but it is readily apparent that the airport building sites are widely scattered by such a plan and that persons traveling out to such a field might be forced to travel half way around the port in order to reach a particular hangar or office. It is also apparent that buildings in the corners of such a field might seriously obstruct several of the runways A simple and logical arrangement of airport areas is shown at "B" in the accompanying sketch, taking the length of one side of the field as a radius and laying off an arc from one corner of the field to the opposite corner in such a manner as to concentrate all airport building sites in one corner of the field and at the same time produce a quadrant shaped runway area in which can be placed runways of greater average length than in the circular area previously considered, and with all of these runways completely unobstructed at either end Any visitor traveling from the city to such an airport, would find all buildings grouped in the corner of the field nearest to the city served, and because of this grouping an efficient relation is obtained between the various buildings and the operations conducted in them This latter arrangement is that adopted by the first prize winners in the Lehigh Competition and is admirably illustrated by the completed plan drawing of what has been titled the "Quadrant Airport."

Within the quadrant the architects have placed eight runways, or double the number required by the rules of the competition, making it possible for planes to always operate within an average of 11 deg of any possible wind, and at the same time for arriving and departing planes to operate from entirely different runways greatly facilitating the handling of traffic In developing a new airport it would be logical to start with four of the eight runways and to add the others as traffic might warrant An important part of the present plan is the provision of three taxi lanes which serve to simplify and speed the taxiing of planes between the loading point and runways.

In operation the runways and taxi-ways will be equipped with a system of colored signal lights for handling both ground and aerial plane traffic Arriving planes will find a vertical red light at the head of every runway but one, which runway will be designated by the display of a green light as the landing runway in use at the time Planes taking off will leave the loading point as the dispatcher directs by the operation of the signal lights, and will travel to the head of the takeoff runway via a taxi strip, guided to each by the signal lights which are to be provided at every runway and taxiway intersection Thus if a plane were taxiing and about to cross a runway in use at the time, it would be stopped at the intersection by the display of a red light which would change to green the moment that the runway was clear Conversely, if traffic were being permitted to flow along a taxiway and across a runway being used for take-off, that runway would be temporarily closed by the red light at its head In actual operation it is unlikely if any plane would ever taxi across a runway in use because the farthest from the depot of the two runways being

used will normally handle departing traffic, and that closest to the depot arriving traffic, permitting plane traffic on the ground to travel around the field and depot in an unbroken line always moving in the same direction for any given wind condition.

As shown by the plan of the Quadrant Airport, hangars are laid out along the semicircle which marks the division between runway area and that devoted to buildings. Ground traffic from the city served by the airport would arrive at the corner nearest to that city and travel directly to the administration building, or by means of a paved road along the rear of the line of hangars, to any particular hangar. Ample parking space for automobiles is provided to the left and right in front of the administration building, and also along the road in rear of the hangars. The entire area devoted to buildings is completely removed from the scene of flying operations and is ideally adapted in location and shape to

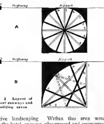


Fig. I. Layout of airport runways and building areas

attractive landscaping. Within this area would be placed the hotel, garages, playground and swimming pool, and whatever other facilities of this sort might be developed.

The field control tower and loading point is located in the center of a circular area toward the field from the administration building and at the mid point of the semicircular row of hangars. Even the largest land transport planes now projected would find ample space to taxi completely around the loading point to any designated loading "tunnel" and then on under its own power and without interfering with any of the other planes which might be loading or unloading at the same time. The distance from the administration building to the center of the loading point would be 300 ft. in the design submitted, while the individual loading tunnels would each extend out for 100 ft. from the center of the loading point. Entrance to the loading point station is gained by means of an underground tunnel leading out from the administration building. Within this tunnel the incoming and outgoing passengers are provided with entirely separate lanes, and within the loading point the lanes from plane "tunnels" to underground tunnel are marked off by gates or chains, adjustable as incoming or outgoing traffic fluctuates, but always preventing any possibility of confusion in traveling to and from planes. The plane "tunnels" are of masonry construction for a considerable portion of their length, with a sliding steel canopy telescoping into the permanent portion of the tunnel which may be extended out to the cabin door of an airplane to provide a protected passage from depot to plane interior, this arrangement completely eliminates any contact by the passengers with dirt, wind, or noise.

If immigrants are to be handled through the loading point a separate passage is provided in the underground tunnel, leading to a row of examining and administrative offices in the administration building. An additional lane provides for the handling of baggage and the movement of employees between the administration and loading point.

The star shaped loading point with an underground passage to the terminal building offers several possibilities. The present plan provides a supplementary loading point on the airport level leading directly into or out of the administration building, thereby making it possible for a private owner to land and taxi to the administration building, go in and buy a ticket, and go on out through the underground passage to enplane upon a regular transport plane for some distant point. Or this supplementary loading point might be used for taxi-plane and sight seeing operations as a means of keeping such traffic apart from the transport operations. A modification of this star shaped loading point is now in use by Western Air Express. Three tunnels run out to the planes on the field level directly from the administration building. By slightly increasing the radius from the center of the loading point out to the planes it is possible to provide nine tunnels instead of five, and thus handle nine planes simultaneously around one loading point. A further logical development is to establish two or three loading points in conjunction with the one administration building, with separate underground passages out to each point, thereby making it possible to handle as many as 27 planes simultaneously. This is graphically illustrated in Fig. II & IIA, and it has been suggested by the architects that where a group of three loading points were employed, the central unit would be placed at the greater distance from the administration building, providing the dispatcher, who would be located in the central unit, with a better command of the field traffic. A further possibility is to segregate traffic among the three units, handling all arriving transport planes at one point, all departing transport planes at a second point and reserving a third unit for all taxiplane and private plane traffic. Of course the dispatcher would use his facilities as experience and current traffic might dictate.

THE STAR loading point as proposed in the winning design of the Lehigh Airports Competition, provides a three story arrangement with passenger handling on the ground floor, pilot's room and registration office, weather office, and radio room on the second floor, and the control room, occupied by the dispatcher, on the third floor. From his position the dispatcher can at the same time see every plane that is loading as well as the entire field area. There are no airport buildings opposite the ends of any of the runways except in the case of the runway which bisects the quadrant landing area and which runs directly toward the loading point. With 15 of the possible 16 take-off directions completely unobscured, the airport would be laid out with relation to the known winds so that the runway in question would never be used for take-off. This one runway could also be split to pass on either side of the loading point, completely removing any mental hazard which might conceivably attach to the present arrangement.

Hangars provided for in the winning design are of

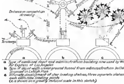


Fig. II. The manner in which the star loading station can be progressively developed to handle from three to twenty seven aircraft simultaneously and efficiently

the rectangular type with sliding doors at each end and a maximum door width of 125 ft. to assure the accommodation of any land plane now projected. As required by the conditions of the contest four-fifths of the hangar space is devoted to storage and one fifth to service. All hangars are set with door openings at right angles to the quadrant arc instead of facing the field, insuring greater privacy to the various companies leasing hangars, and also giving each hangar an adjacent apron which can be used without cluttering up the main taxi apron extending all along the row of hangars on the field side. Fueling stations are located on this main taxi-apron and an ample area is set aside just off the apron along the border of the flying area to left and right of the loading point, for the purpose of parking planes. One of the most commendable phases of this arrangement of administration building, loading point, hangars, taxi apron and plane parking area, is that it concentrates all of these activities in the most efficient way, greatly reducing the confusion which might otherwise attach to contact between the general public and the various air terminal activities.

The administration building is of modern design, being appropriate to such a modern problem as an airport, the main portion of the building being occupied by the ticket offices and waiting room, with toilets and rest rooms in the basement, and the ceiling of the main waiting room extended two stories as in most rail depots. Three wings, one story in height, extended to left and right, and toward the field from the main portion of the building. They are occupied by the restaurant, administrative offices, immigration offices, freight and mail handling rooms, etc. On the roof of each of these wings an open air observation platform is provided for the use of the general public in observing field operations. An additional ground level area is open to the public to left and right of the administration building and adjacent to the circular taxiway around the loading point but separated from it by appropriate fencing. Comfort stations and concessions are provided for in this area.

BECAUSE the competition program concerned itself only with the problems of passenger terminals, no particular attention was given in the winning plan to the handling of large volumes of aerial freight and express. Although it is true that almost all railways handle their freight shipments at separate terminals from their passenger facilities, it is the opinion of Mr. Zimmerman, that air freight and express shipments will in general be handled from the same field as passenger traffic, for a time at least, the freight depot itself to be set apart from the other operations. This freight depot would probably consist of a long two way shed similar to those used in most rail freight terminals, permitting the arriving planes to range along one side of the shed under a protecting roof, and to discharge freight, while the departing planes would move along the opposite side of the shed taking on their loads.

This airport as laid out should meet all passenger air transport requirements for several years to come in the opinion of the designing architects. It would be placed at a normal distance from the city served, relying upon good surface arrangements to speed terminal connections to downtown point. If roof top air fields can be developed they will work in admirably, it is thought, with the major airport plan, since passengers arriving at the main terminal could there replane in smaller taxi planes and be flown to their various roof top destinations, which will in any case probably be too scattered to make it worth while to move the major airports much closer to the centers of our cities.

As provided by the requirements of the competition, all runways and buildings, where practicable, are designed to employ Portland cement. The design of all the buildings submitted with the winning plan, is most attractive and carries out the futuristic motif so appropriate to an airport, but of course the general type of architectural

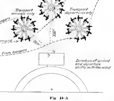


Fig. II-A

treatment of any or all of the airport buildings might be altered at will without affecting in any way the present plan of field layout.

If there are to be airports of the future developed in sparsely settled portions of the country and surrounded by country residences from which the workers would daily fly to their employment in the large business centers, such a development is still very much in the future and has not been considered by the designers of the plan awarded the grand prize by the judges of the Lehigh Airports competition. This design is, and is particularly worthy of study because it is, a design for the present planned to solve the problems of the present and immediate future insofar as passenger air transport terminal traffic handling is concerned.

AVIATION PROGRESS UNDER THE Soviet

A description of the work of the Russian Central Aero-Hydro-Dynamic Institute, with some of its practical results

By V. M. Petliakov

THE PURPOSE of this article is to describe the work and the product of one of the scientific institutes of the Soviet Union, the Central Aero-Hydro-Dynamic Institute (Tsagi), which is responsible for the designing and building of the plane, the "Land of the Soviets", used in the 12 900-mile Moscow-New York flight, as well as of many other Soviet planes.

The "Land of the Soviets" is of the Model ANT named after the well-known Soviet engineer, Andrey Nikolaievitch Tupolev, who designed also "The Wings of the Soviet", which recently completed a flight covering many European countries, and other Soviet planes with long-distance records to their credit.

V. M. Petliakov is assistant to A. N. Tupolev, designer of the "Land of the Soviets" and other Russian planes. He describes the extensive equipment for aviation research which is available to Soviet engineers, and the way in which research is coordinated to fit it to the practical problems of airplane construction. From the emphasis placed upon laboratory work, he proceeds to detailed descriptions of "The Land of the Soviets" and other Russian planes, together with some of their performance figures on recent notable flights.

The "Land of the Soviets", was built in its entirety in the Soviet Union—with the exception of the engines of the German BMW type, and the wheels. The author of this article has had the pleasure of working with Mr. Tupolev as one of his closest associates in the construction of the plane. It is necessary, perhaps, to make it clear that the plane was not only constructed in the Soviet Union, but also solely of native materials (again, with the exception of the engines), and by Soviet workers.

The Tsagi Institute was founded in 1918, in that difficult period during which the country was torn by civil war and foreign intervention. The founder of the Institute was Prof. N. E. Zhukofsky, whose name as the founder of Russian theoretical aviation research is well-known abroad and in the U.S.S.R. The very name of the institute signifies that the objects of its research work are two elements,—air and water. The chief work of the institute consists in studying the mechanical powers of air and water in order to utilize technically their useful properties, and to apply them for economic purposes. On the other hand, the Tsagi Institute also studies the adverse characteristics of air and water in order to overcome them. The purpose of its work, then, lies not only in the field of aviation, but is considerably wider, including aviation as only a part of its work.

The basic principle on which the work of the Tsagi Institute has been built is that of carrying out each piece of research to a concrete result, in order to permit its utilization by industry. With regard to aviation, for instance, the final purpose of its work is the creation of airplane models which can later be produced in the required quantities in Soviet factories. In order to achieve concrete results it is necessary to go through considerable preliminary research work. This work is along two channels, theoretical and experimental.

THE TSAGI INSTITUTE has a number of divisions. The listing of those relating especially to aeronautics may be of interest to American readers.

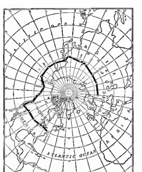
1 Theoretical Department. This division has provided us with considerable material concerning the dynamics of the flight of airplanes, the theory of the method of calculating propellers, and the methods of calculating the performance of the plane.

2 Experimental Aerodynamic Department. The principal work of this department is connected with studies in regard to conditions of aerodynamic tunnels. This department has a large wind channel, 50 meters long (164 ft.), with two working cross sections of three and six meters (9.8 and 19.7 ft.) in diameter. The cross section of the wind channel is octagonal. The tunnel gradually tapers from the larger to the smaller diameter. It is of the closed circuit type, and is built as two separate tunnels, one of three and one of six meters in diameter, so that when the six-meter tunnel is required for work the connecting part can be removed, and work can be conducted in the shorter six-meter tunnel. [This is a very novel feature in wind tunnel design. The usual practice with a tunnel which is to be operated at two different diameters is to fit a throttling insert into the throat, to reduce the diameter and thus shorten the experimental section by extending the entrance and exit cones into it. The method used at the Tsagi Institute of removing the entrance section of the small tunnel bodily is shown in one of the illustrations in this article.—Ed.] The wind tunnel and most of the measuring instruments have been designed by members of the Institute.

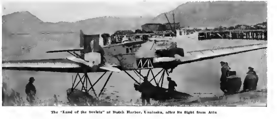
The tunnel gives a very good efficiency, which is shown by the fact that the velocity of the flow can be maintained at 100 meters per second (223 m.p.h.) through the use of a 6-meter (9.8 ft.) propeller with a motor of 650 hp. Until recently this tunnel was the largest in the world. Last year a larger tunnel—20 ft. in diameter, that is only 4 in. larger than the Tsagi tunnel—was constructed at Langley Field in the United States.

3 Engine Department. This department, aside from research work in the construction of other types, also conducts work in the experimental construction of aviation engines, which later on are put into actual operation. The work in testing engines on platforms furnishes considerable material for use in selecting types for different airplanes. This work also helps to solve the problems of installation and operation of engines in airplanes. The installation of a special low-pressure chamber was completed recently, and a study of the performance of engines at high altitudes is being started.

4 Department for the Testing of Aviation Materials and Designs. The work of this department is to specify the technical conditions which must be met by all materials that are used in the construction of planes, to create new materials if the existing materials do not



Route of the "Land of the Soviets" in its flight from Moscow to New York


The "Land of the Soviets" at Dutch Harbor, Unalaska, after its flight from Attu

satisfy newly-arising needs and to evolve methods for the preliminary working of materials as well as for utilizing them in the construction of planes. The department has a number of laboratories, including chemical, physical, metallographic, and mechanical laboratories.

While space does not permit a description of the methods of research work conducted by this department, I shall mention a few of the completed pieces of research, which will give an idea of the character and the significance of the work. The new light metal alloy known as Kolchug aluminum was prepared by this department together with the Kolchugin plant of the Soviet Non-ferrous Metal Trust. Not only has the method of obtaining this alloy been evolved, but, with the assistance of still another department of the Tsagi Institute, standards have been prepared for a variety of semi-manufactured products of this material,—including tubing, sheets, rivets, etc. At the present time Kolchug aluminum produced in Soviet factories is used in the construction of almost all metal planes built in the country. Research work on glues and on the methods of gluing has made it possible to utilize for aviation purposes the lower grades of wood, at the same time eliminating the necessity for importing foreign glues. This department has prepared, among others, a new kind of glue prepared from casein which can be mixed dry for cold gluing. The discovery of the new type of glue has resulted in reducing costs and in increasing the resources of wood products which can be drawn on for use in airplane construction. A study of fabrics and protective coatings has resulted in the evolving of a new type of cloth for use in airplane construction.

The other main activity of the department is in conducting research work in airplane construction. The present day airplane presents a very complex structure, for which it is difficult to make precise calculations. In view of the fact that the least error in this respect may result in disaster, extended use is made of static tests of planes and their parts. The work of this department together with that of the Aviation Department in this field, has given very valuable results. A number of methods of estimating the strength of planes have been involved.

The Experimental Division of the Aviation and Hydro-Aviation Department will conduct its work in a specially built closed channel 200 meters long, 12 meters wide and $6\frac{1}{2}$ meters deep (656 ft. by 39.36 ft. by 20.32 ft.) which is being equipped at the present time. The channel is filled with water, and is used for testing propellers for boats, and models of pontoons, flying-boat hulls, etc. The channel is used also for hydro-dynamic research, that is, for the theoretical study of hydro-dynamic forces which affect the hulls of seaplanes and of other vessels.

Itinerary of the Moscow-New York Flight

Date		Hop	Distance (Kilometers)	Time (Hours and Min.)
Aug	23	Moscow-Cheliabinsk	1,500[1]	11 05
Aug	24	Cheliabinsk-Kurgan	200[2]	1 42
Aug	25	Kurgan-Novosibirsk	1,150	6 56
Aug	26	Novosibirsk-Krasnoyarsk	670	3 47
Aug	27	Krasnoyarsk-Irkutsk	820[3]	5 19
Aug	31	Irkutsk-Verkhneudinsk	265[4]	1 27
Sept.	1	Verkhneudinsk-Chita	430[5]	2 40
Sept.	2	Chita-Blagoveschensk	1,250	8 52
Sept.	3	Blagoveschensk-Khabarovsk	628[6]	3 54
Sept.	12	Khabarovsk-Nikolaevsk	850	4 19
Sept.	18	Nikolaevsk-Petropavlovsk	1,205	8 17
Sept.	21	Petropavlovsk-Attu	1,100	8 48
Sept.	24	Attu-Unalaska	1,415	7 09
Sept.	27	Unalaska-Seward	1,300	8 06
Sept.	29	Seward-Sitka	900	7 35
Oct.	3	Sitka-Waterfall	240[7]	2 12
Oct.	13	Waterfall-Seattle	1,220[8]	10 11
Oct.	18	Seattle-Vancouver	248[9]	2 58
Oct.	19	Vancouver-San Francisco	970	6 27
Oct.	23	San Francisco-Salt Lake City	1,000	7 47
Oct.	24	Salt Lake City-North Platte	960	6 55
Oct.	25	North Platte-Chicago	1,084	6 51
Oct.	28	Chicago-Detroit	385	3 10
Nov.	1	Detroit-New York	1,070	7 05

Summary

	Distance (Kilometers)	Time (Hours and Min.)
Over land	12,582	87 03
Over water	8,030	54 30
Total	20,812 (12,883 miles)	141 33

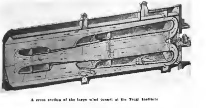
Average Speed—148 km. (91.5 miles) per hour

Total time enroute	72 days
of which	
In flight	24 days
Changing engines, making repairs, refueling, etc.	36 days
Weather delays	5 days
Receptions in U. S.	6 days
Time lost in encircling earth eastward	1 day

[1] Forced landing at Cheliabinsk on account of engine trouble
[2] Landing for refueling
[3] Landing at Irkutsk to change engine
[4] Landing at Verkhneudinsk on account of bad weather in mountains
[5] Landing for refueling
[6] Landing to change engines and substitute pontoons for wheels at Khabarovsk
[7] Forced landing at Waterfall due to engine trouble and changing engine
[8] Changing pontoons to wheels at Seattle
[9] Forced landing at Vancouver (near Portland, Oregon) on account of engine trouble

The "Wings of the Soviet" at Le Bourget Field, Paris during its European tour

Aero sleighs of the Tsagi Institute type, a small number of which have been built by one of the state factories, have participated in several races, and have been shown to be the only reliable and seemingly the only possible means of high speed transportation under conditions of bad roads in winter time. At the International Aviation Exposition at Berlin the Tsagi Sleigh attracted wide attention. The engine department of Tsagi has designed for this sleigh a special air-cooled motor which is somewhat different from the usual aviation engine. This type of engine is now being constructed in a government factory.



A cross section of the large wind tunnel at the Tsagi Institute

As stated above, the Institute has constructed and turned over for industrial production several types of airplanes. One of these planes is the all-metal sesqui-plane "Proletarian," designed by A. N. Tupolev. In 1926 this plane made a flight, piloted by M. M. Gromov, over the route Moscow-Berlin-Paris-Vienna-Warsaw-Moscow in 32 hours flying time.

The all-metal sesquiplane "Proletarian"

In 1927 a plane of the same type with a Soviet-built engine made a flight from Moscow to Tokio and return, covering a distance of 13,700 miles. The plane was piloted by S. A. Shestakov with D. V. Fufaev as the mechanic (both of whom took part in the recent flight to America). Earlier this year a European flight was made (July 10-Aug. 8) by a tri-engined plane, Tsagi ANT 9, also designed by Mr. Tupolev. This plane, known as the "Wings of the Soviet", covered a distance of 9,037 kilometers (about 5,615 miles) over the route Moscow-Berlin-Travemunde-Berlin-Paris-Rome-Marseilles-London-Paris-Berlin-Warsaw-Moscow. The flying time was 53 hours and the average speed 170.5 kilometers per hour (106 m.p.h.).

The plane was in flight 30 days and protracted stays were made in a number of European capitals, where the plane attracted a good deal of attention. The flight of the "Wings of the Soviets", organized by the popular aviation society Osoaviakhim, which also sponsored the Moscow-New York flight, and by the Soviet commercial aviation company, Dobrolet, was not made for the purpose of establishing any records. Its principal purpose was to make a flight showing the best normal operating efficiency under differing flying conditions in order thus to form an opinion of the new model.

The plane "Wings of the Soviets" was an all-metal monoplane with wings located on the fuselage. The air-cooled Titan engines were each 230 hp. The central engine was located in the nose of the fuselage and the other two on either side of the fuselage. The plane had dual-control with a separate glass-covered cabin for the flyers, nine passenger seats, toilet, and three baggage rooms, two of which were located in the fuselage and one in the wings. In order to insure maximum safety the tanks were located inside of the wings while the center section over the fuselage, as stated above, was used for baggage. The maximum normal weight of the plane was $5\frac{1}{2}$ tons. The flight from Moscow was started under overweight conditions, its total weight reaching $6\frac{1}{2}$ tons. It is significant that the "Wings of the Soviets" was designed, constructed and tested in a very short period of time. The work of designing the plane was put under way in December, 1928, and the plane was completed by May, 1929. During the month of May all the tests were completed and on June 6 the plane started on its long distance flight Moscow-Odessa-Sebastopol-Odessa-Zmo-vievsk-Kiev-Moscow, covering a distance of 4,000 kilometers (2,480 miles) in 26 hours.

The flight of the plane, the "Land of the Soviets," from Moscow to New York, sponsored by the Osoaviakhim society, was started Aug. 23 and completed Nov. 1. During this period the plane covered 12,883 miles in 141 hours, 33 minutes flying time. Of the total distance covered, 7,864 miles were flown over water, in 87 hours, 3 minutes, flying time, and 5,019 miles over land, in 54 hours, 30 minutes flying time.

The flight was started late in the year and, therefore, was conducted under extremely unfavorable meteorolog-

ical conditions Almost during the entire flight the plane met severe storms Particularly dangerous was the route from Nikolaevsk in Siberia to Seattle, most of which was over water The flight necessitated changing the landing gear twice First the two-wheeled gear was changed to two floats at Khabarovsk in Siberia, and later the wheels were put on again at Seattle

The crew of the "Land of the Soviets" consisted of Mr S A Shestakov chief pilot F E Bolotov naval pilot, V V Sterligov, aero-navigator; and D. V. Fufaev, mechanic

The all-metal two-engined plane, "Land of the Soviets", is a monoplane with multi-spar wings. The engines are located on steel tubing mountings at the leading edge of the wings, on either side of the fuselage The two BMW-6 engines are of 600 hp each They have a compression ratio of six and are equipped with Zenith carburetors

The wings are constructed of five bridge-like spars and made of tubing attached with perpendicular flat ribs, and covered with corrugated Kolchug aluminum

The fuselage consists of four longerons, with ribs perpendicularly affixed, reinforced with special stays of duraluminum connecting diagonally the top and bottom longerons on each side of the fuselage The outside of the fuselage is covered with corrugated Kolchug aluminum The tail and all rudders are also made of metal and covered with corrugated Kolchug aluminum

To facilitate the transportation of the aeroplane by railroad, and for overhauling and installing engines the aeroplane may be disassembled by removing the following units

1. The end parts of the wings with ailerons
2. The front parts of the fuselage consisting of pilot's and navigator's cockpits, with all controls and instrument boards
3. The rear parts of fuselage, stabilizer balanced surface, fin and rudder
4. The middle section of the wing also has detachable leading and trailing edges

All detachable parts are affixed with steel bolts

The aeroplane is made with two kinds of landing gear wheels and pontoons. The landing gear with wheels consists of two wheels, with diameter of 1 250 x 250 mm (50 x 10 in), and is attached on half-axles with binding of rubber shock-absorber cord to the "V" of the landing gear These axles and the "V" are constructed of steel tubing The landing gear is attached to each side of the wings with three bolts

The flotation gear of the plane consists of two pontoons, each affixed to the aeroplane by means of eight steel tubes The struts in the sea landing gear are attached to the wings at four points, while in the land gear they are attached at three points

Inside of the wings are installed thirteen petrol tanks with total capacity of 872 gal The two main oil tanks are installed behind the engines inside the cowling These have a capacity of 50 kg (110 lb) each In addition to these, there is an extra oil tank holding 60 kg (132 lb), from which the oil can be transferred to each of the main tanks by means of a hand pump

A water tank of 60 kg. capacity is provided for supplying fresh water on sea flights This water tank is also

General Specifications of the "Land of the Soviets"

Wing span (including aileron compensators)	94 ft
Maximum wing chord	18 ft.
Over all length	59 ft.
Over all height (on tail skid)	15 ft.
Over all height (in horizontal position)	20 ft.
Stabilizer span	24½ ft
Total wing area (including ailerons)	1 290 sq ft
Total area of ailerons (with compensators)	149 sq ft
Area of stabilizer	105 sq ft
Area of elevators	52 sq ft.
Area of rudder	44 sq ft.
Area of keel	34 sq ft.
Weight, empty	9,900 lb
Maximum speed.	125 m p h
Cruising speed	100 m p h
Landing speed	56 m p h
Normal range	1 430 miles

connected with the engine radiator, so that in case of emergency the water can be transferred from the tank to either radiator by hand pump

The entire plane with the exception of the chassis and the engine mountings is built of Kolchug aluminum Steel has been used only in the engine mounts and in other parts where extra heavy pressure is applied The entire amount of steel used in the plane is very small The plane is equipped with radio receiving and transmitting equipment with a radius of action of about 1000 kilometers (620 miles), and also with a number of navigation instruments

During the flight over the sea the plane was equipped with a collapsible rubber boat for four people and special life preservers as well as with an anchor of 50 kilograms (110 lb) supplied with 60 meters (195 ft) of anchor rope That all the precautions taken were needed was shown by the fact that the entire flight over the sea was made under extremely unfavorable conditions The landing at Dutch Harbor was made in such violent weather that it took two American cutters at least two hours before they succeeded in anchoring the plane.

The crew of the plane had frequent occasion to express its gratitude, on behalf of the Osoaviakhim Society and on their own behalf, for the ready aid of the U S Navy.

Front view of the "Land of the Soviets" on landing gear

THE *Junkers* G-38

By Richard M. Mock

Representing an intermediate step between the conventional type of airplane and the so called flying wing, the new Junkers G-38 is the most recent creation of the German company whose name it bears. The G-38, as is generally known, is the world's largest land plane The present article has been prepared following a personal inspection by Mr. Mock, who was formerly technical editor of AVIATION, *more recently a member of the Bellanca engineering staff, and is now at the Ernst Heinkel Flugzeugwerke, Warnemunde, Germany, where he is supervising the design and construction of an airplane for the American market.*

AFTER a steady progress towards larger types of airplanes by the Junkers Flugzeuwerke A G Dessau, Germany, it has produced the G-38, which the designers claims as a stepping stone between the present type of conventional airplane and the flying wing

The G 38 the world's largest landplane, is an all metal cabin monoplane powered with four engines mounted entirely within the thick wings wings thick enough to contain a man standing upright The span of the plane is 147.5 ft (45 m) while the overall length is comparatively short 75.5 ft. (23 m) It has a height of 18 ft and the thick wing has an area of 3120 sq ft. (290 sq. meters)

The power plants consisting of four Junkers engines developing a total of 2400 hp, are mounted in the wing and, from a structural viewpoint, are integral with the wing cellule Thus, the engines are out of the airstream, and in a location where they may be inspected and serv-

Photograph of the Junkers giant monoplane showing its size in proportion to the recently developed Junkers sport plane

iced while the plane is in flight. At the same time good working conditions for the propellers are obtained by long drive shafts projecting in front of the wing. These shafts are enclosed in a streamline housing faired into the leading edge of the wing.

TO DATE the plane has made more than twenty flights, some as long as one hour. When the writer visited the Dessau works, a number of minor changes were being made. Because of the many radical features in its design and because all tests were not completed, the constructors were reluctant about saying very much as to their expectations and, as well, about any of the details of its construction.

At first two L-55, 500-650 hp. and two L-8, 400-hp. engines were used though the L-55's will be replaced by two Junkers L-88 800 hp. engines and thus give a total of 2,400 hp. The weight of the G-38 empty is stated to be between 28,600 lb. and 30,800 lb. (13 to 14 metric tons), while the gross weight is from 44,200 lb. to 54,000 lb.

Close-up of one pair of landing wheels showing Electron casting connecting member and shock absorber

(20 to 24½ metric tons). Thus the useful load is between 13,200 lb. and 24,300 lb. (6 to 11 metric tons). It is stated that with 6,600 lb. pay load the range is about 2,200 miles.

The performance has not yet been determined though the high speed is estimated at about 125 m.p.h.

The airplane was designed to use the Junkers heavy oil Diesel engines which have been undergoing flight tests in Dessau in a small single engined Junkers monoplane. With the Diesel engines it is stated that the performance of the G-38 will be greatly increased allowing a larger carrying capacity and an increased flying range. The Diesel engines were not installed for the first flights as it was thought inadvisable to have too many radical and new details undertaken at the same time.

The G-38, at the present time has its cabin empty though the plane was laid out as a long distance freight and passenger carrier. Normally it should carry about 30 day passengers with the rest of the load being freight. If necessary, with a shorter range, 48 passengers and baggage can be carried though the cabin does not appear as though it would be very comfortable when housing so many persons. As a night passenger transport, beds can be provided for 16-22 people.

IN 1910 Professor Hugo Junkers obtained a patent on the principle of a flying wing containing passengers, crew, engines and all equipment and load, thus eliminating the usual parasite resistance of fuselage and engines.

The G-38 approaches this in that its four engines are completely contained in the wings while the fuselage has been widened and shortened until it becomes merely a large cabin extending into the stubs of the deep wings and tapering in cross section very rapidly into a support for the biplane tail surfaces.

This machine was designed as a forerunner of the Junkers G-1000, a projected 100 passenger multi-engined design containing all passengers, crew and engines in the wing and differing from the G-38 chiefly in that the G-1000 has no fuselage and in its stead has two short stubs projecting in front of the wing to support the stabilizer in front of the mainwing (as in the "Ente" or Duck type). The vertical control surfaces are mounted on the wing tips and thus reduce all resistance to a minimum.

However, in the design and construction of the G-38 more conventional methods of flight control were followed though the plane contains most of the essential elements to characterize it as an intermediate step toward the development of the flying wing. The G-38 wing was made sufficiently deep that a great portion of the load could be carried in its interior and thus give a more efficient type of structure by having the load and the supporting members close together. In addition the resistance is reduced as the only disturbing units producing parasite drag are the landing gear, control surfaces and the comparatively small fuselage.

The aspect ratio of seven is quite good for a plane of these proportions. The wing has a great taper providing a very large chord and thick section at the root. It is interesting that the wing is almost flat on top and that the taper produced what might be termed an effective dihedral.

Also the wing has an effective sweep back by having the trailing edge lie almost completely on a straight line connecting the trailing edges of the wing tips and having the taper in plan form cause the leading edge and consequently the median line of the wing to sweep backward. The wing chord at the root extends almost the entire length of the cabin portion of the fuselage making for good longitudinal stability with varying wing loads and thus eliminating the fuel tank type of balance found in the tail of many European transport planes.

The wing is very deep, being about the same as the depth of the fuselage. The upper surface of the wing is flush with the roof of the cabin and the lower surface is at a level with the floor of the cabin. Under the cabin floor is another compartment used to house baggage and freight and at the same time act as a "crash space." In

View of a portion of the front of the G-38 showing the landing skate installed during the early test flights.

the event of a crash this compartment would be destroyed and the force would be absorbed in deforming its structure, thus protecting the cabin. It is notable that in all Junkers designs there is considerable structural material under the cabin to provide protection in the event of a crash.

Usually the wing structure extends under the cabin but in this plane because of the great depth of the wing this was not possible and therefore this compartment was added. This portion under the cabin gives the G-38 the appearance of a high wing monoplane. In German it is called a "Middle Decker."

The structure of the fuselage is of open section duralumin profiles riveted into the form of a deep truss and reinforced by an outside skin of corrugated duralumin. However, the rounded nose of the fuselage and the leading edge of the inner portion of the wing, as well as the engine drive shaft fairings are covered with smooth, flat duralumin sheet. Though this might be to facilitate the manufacture of sheet surfaces with bends around two radii, it is interesting to know that there are being completed at the Junkers plant two identical high speed two seater monoplanes, one of which is covered with flat sheet and the other with corrugated sheet to aid in investigating the performance of the two designs.

Detail view of the tail unit of the G-38 showing its size with relation to the group of men in the photograph

As mentioned above the interior of the cabin is as yet unfinished. However, it is obvious that the cabin would lend itself both to accommodation of freight forward where there can be no windows because of the deep wings at the sides. Freight can be carried in this portion which extends some distance into the wing roots. Behind this the cabin is narrower and has some windows at the sides above the wing. Windows will be added forward later. The interior can easily be divided into various compartments either for sleeping passengers, day passengers and freight, private compartments, etc. Incidentally, two lavatories and washrooms are provided.

COMPARED with the wing span the length of the fuselage is short, giving a close coupled tail. In front of the wing is a small projection or nose containing a many windowed compartment for the operating officers. Behind and above this compartment is the cockpit for the two pilots sitting side by side with dual control. The cockpit is very large and roomy with glass covering and the visibility is quite good considering the great size of the machine. The windows may be opened should the pilot wish a better view. In addition, there was mounted temporarily a mechanical "feeler" under the plane to indicate proximity to the ground when landing. The plane is actually directed by the officer in the nose and the pilot fulfills a duty comparable to the pilot of a steamer. Behind the pilots' cockpit is a large vertical instrument board on which are mounted all of the instruments and controls for the power plants. A chief mechanic is stationed at this panel and thus relieves the pilot of the task of operating the engines.

At the sides of the engine control compartment are alleyways leading to the individual engine compartments in the wing. However between the fuselage and the inboard engines, and accessible from these alleyways,

are small compartments in the leading edge of the wing for radio operator or for chairs for two people who could sit comfortably and look through the windows in the leading edge

These compartments, as well as those for the engines located similarly but situated further outboard, as well as the compartments in the center of the wing for tanks and freight, are all distributed between the main structural members of the wing trussing. However, the trussing is laid out so that when one walks in the six foot deep wing the structure is no more noticeable than that in the fuselage cabin of a well designed transport plane

The wing is built entirely of duralumin with some steel parts where high stresses occur In detail, it follows usual Junkers practice except at points where savings were made by variations permitted by the great size Like other Junkers designs the covering is of corrugated duralumin riveted to a multispar truss structure varied slightly to permit the compartments in the wing The space in the fuselage projects into the first bays of the wing truss increasing the size of the cabin and reducing some of the loading on the wing structure.

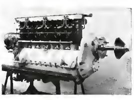
One of the most interesting details is the power plant installation The engines are water cooled and have their radiators projecting below the lower surface of the wing The radiators are each individually retractable into the compartment above to regulate the cooling or to facilitate repairs in flight However, it was found that these radiators as well as the engine exhaust piping heated the engine compartments so much that a special aircooling system is being installed The engine compartments are quite roomy, allowing one to walk around comfortably. The writer was permitted to enter the inboard engine rooms when there were about four men already there This is a great advantage for the repair of the engines without removing them and also for facilitating inspection during flight by both mechanics and the plane's officers

The Junkers L-88 gasoline engines are rated at a maximum of 800 hp. at 1950 r.p.m. and normal 700 hp at 1800 r.p.m. The propellers rotate at a slower speed than the crankshaft, being fitted with a reduction gear having a ratio of 1 1.5. These engines are the twelve cylinder 60 deg Vee type with four valves per cylinder. The bore and stroke are 6.3 in by 7.48 in (160 mm by 190 mm). The cylinders are individual with each having a separate water supply for cooling the cylinder as well as the valve case and valve guides The valves are driven by overhead cams with no rocker arms The cams are driven by vertical shafts With normal spur gear for propeller drive, the weight is 1495 lb (680 kg.) or 1.87 lb per hp

The two inboard engines are similar to the L 88 engines except that they are six instead of twelve cylinders and have half the power

Later the Junkers Diesel engines will be substituted. These engines are the result of a long research program that is just about completed At present the six cylinder Junkers Diesel engine is rated 700-800 hp and weighs 2,245 lb (1,020 kg.) or about 3 lb./hp One of the most important features in the development of this engine is the nozzle design The system provides for four nozzles which completely vaporize the fuel in 0.001 sec. and mix it completely with the combustion air by means of the proper tubulence and rotation that is controlled in such a manner as to have proper side influences give practically perfect combustion.

Another important feature is the turbo-cleaning pump with a running wheel operating at a peripheral speed of 658 ft per sec. (200 m./sec.) This pump also has a



Above The Junkers L-8 400 hp. engine two of which are used in the G-38 Right One of the L-88 engines of 800 hp. which has an overall length with the hub of 72.5 in., a height of 50.4 in. and a width of 33 in. Two of these are also used in the G-38

special shaft protected from variations in the drive shaft Special attention had to be paid to the design of the cleaning pipes, due to the resistance at these high speeds

A great deal of study was devoted to the crankshaft bearings Practically every conceivable type of bearing was tried and it is not clear if this point has been completely solved as yet It has been said that many successful experiments have been carried out on torsional vibrations in this powerplant and that an entire new system employing a double crankshaft has been developed

The crankcase is interesting in that it also forms the engine mount It is stiff in all directions, being a casting that must be exceptionally difficult to produce

While in the engine works the writer saw many parts for twelve cylinder Diesel engines These were of the horizontally opposed design with provision that they could be mounted either vertically or horizontally The diametrically opposite cylinders have integral barrels making six barrels for 12 cylinders. There are no valves or cams and, since they are oil injection engines, there is no carburetor or ignition system Therefore it is obvious

that many of the usual causes for engine failures have been eliminated Junkers is in production on similar Diesel engines for motor trucks and marine use as well as for stationary engines Both gasoline and Diesel engine development at Junkers are under the direction of Dr Mader and Dr Gasterstadt

It is planned to use only one compressor for all four Diesel engines for the G-38 and similarly only one starter compressor At the present time there is a small heavy oil driven air compressor behind the left inboard engine This is used to force air under pressure to the present gasoline engines and to start them by a starting slide valve mounted on each cylinder and driven by the camshaft.

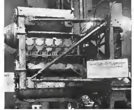
At the front of the gasoline engines are the spur type reduction gears coupled to an oil clutch developed by Junkers Its purpose is to reduce vibration between the propeller and engine The long propeller shafts project well out in front of the leading edge where they drive four blade wooden Junkers propellers fitted with spinners fairing into the streamlining over the shafts.

The control surfaces of the plane are especially interesting They are so laid out that no exceptional forces are required by the pilot to maneuver the craft All of the moveable control surfaces consist of separate units not faired in with the fixed surface in front as is usual practice, but rather having a definite slot between the surfaces The ailerons are auxiliary airfoils mounted below the main wing with the aileron leading edge below and well forward of the trailing edge of the wing. In this way the Junkers' ailerons differ from the Wragg ailerons and flaps developed in America It is the writer's understanding that the Wragg auxiliary airfoil is located entirely behind the trailing edge of the main wing However, the Junkers people, as well as Mr. Wragg, both claim that such a device will definitely increase the lift and thus lower landing and takeoff speeds as well as lower the drag and increase the high speed This device was fitted to a small Junkers monoplane a few years ago Considering that the wing and power loadings of the machine are normal for a plane of this size (14.15-17.3 lb per sq ft and 18.38-22.5 lb./hp) and that the wing is proportionally thick, the landing speed should be quite low When one considers that all of the power was assumed in calculating the above power loading, it will be interesting to note the performance with only three engines running

All of the horizontal control surfaces are balanced in a similar manner The hinges are set back from the leading edge and are supported from above, thus affording some aerodynamic balance In addition, small weighted arms are mounted on each end of each control surface and, as these project well forward of the control hinges, the center of gravity of the control surface is moved forward.

The tail is of biplane design to make it more compact and thus increase its structural efficiency There are three vertical surfaces, a fixed fin and rudder in the center above the fuselage and two vertical rudders mounted at the extreme wing tips of the horizontal surfaces There is only one fixed vertical surface, that is in the middle, the outboard rudders having no fins in front of them The upper stabilizer is adjustable and supported by the middle vertical surfaces and by two inverted Vee struts, one in front of each outboard rudder These inverted Vee struts have the apex of the Vees near the leading edge of the upper stabilizer and their lower ends attached to the lower stabilizer. Like the ailerons, the elevators have weighted arms for balances

The landing gear is especially interesting It consists of five wheels, a tail wheel and two pairs of tandem wheels mounted in the usual positions below the wings. The wheels are all Electron (magnesium alloy) castings and all five are fitted with Knorr pneumatic brakes similar to those made by the same firm for use on railway cars. The tandem wheels are coupled together on each side by Electron castings acting as a lever with a wheel at each end and a fulcrum in the middle between the



The Junkers double vertical cylinder Diesel engine rated at 500 hp.

wheels The fulcrum is attached to a vertical tube which transmits the landing loads to the wing through a shock absorber of rubber chord

The Electron lever is hinged so that the wheels are free to rock about the fulcrum and thus adjust themselves to the unevenness of the ground As the shock absorber deflects, the landing gear rotates about the lower longeron of the fuselage to which are connected three large landing gear support tubes The tubes are fitted with ball and socket joints so that the rocking of the wheels does not effect the struts or the shock absorber To keep the wheels approximately the same level when the plane is in the air there are short strands of shock absorber chord stretched between the axle and the main shock absorber Later the wheels will be paired by a single cowling having the frontal area of one wheel

Some of the general data on the G-38 may be summarized as follows.

Span (45 m.)	147.5 ft.
Length (23 m.)	75.5 ft
Height (5.5 m.)	18 ft
Wing area (290 sq.m.)	3,120 sq.ft.
Aspect ratio	7
Maximum wing thickness (1.8 m.)	5 ft 11 in.
Weight empty (13-14 m tons)	28,500-30,800 lb
Useful load (6-11 m tons)	13,200-24,300 lb
Gross weight (20-24½ m tons)	44,200-54,000 lb
Total power	2,400 hp.
Wing loading	14.15-17.3 lb./sq.ft.
Power loading	18.38-22.5 lb./hp

GENERAL NEWS

HERBERT F POWELL, *News Editor*

House Report Casts Shadow On 5-Yr. Program Fulfillment

Fechet Outlines Needs; Barrack Money Lacking

WASHINGTON (D. C.)—Recommending to Congress an appropriation for the Army Air Corps identical with that estimated by the Bureau of the Budget (discussed in detail in AVIATION for Dec 28, 1929) the Committee on Appropriations at the House of Representatives has submitted a report which casts a serious shadow over the fulfillment of the five-year Air Corps program. The aggregate sum estimated and appointed by the Committee was $35,823,473, which includes construction of hangars, shops, etc., but not the building of quarters and barracks at stations nor most of the expenses of Reserve Corps flying. The major increases in the bill for the fiscal year of 1931, as against the appropriation for the present fiscal year, were in the production and purchase of new airplanes and equipment, raised from $16,189,280 to $17,573,723, and in the miscellaneous operating and maintenance expenses increased from $7-000,000 to $9,192,416.

Calls Equipment Inadequate

In its report the Committee used language which friends of the Air Corps expansion will take as ominous. "The five-year program," says the report, "is not a hard and fast schedule which must be adhered to rigidly. It is nothing more than an authorization to appropriate, subject, of course, to considerations and eventualities that could not be foreseen when the program was adopted. It would be a mistake to expect or require strict adherence to a procurement program for a product so unstable that obsolescence occurs between order and delivery dates." This has to be read in conjunction with the declaration of General Fechet, Chief of the Air Corps, in response to a question during the hearing: "In the light of the experience gained since the passage of the act we are now convinced that the (five year) program is not well balanced and satisfactory, too few airplanes to equip an Air Corps of the size which the Congress authorized." Subsequently General Fechet said more pointedly "There has not been enough aircraft authorized for the national defense." He further declared that "With the position in which we find ourselves now at the end of this fiscal year, with the appropriations we have now available, I feel that we are going to need $59-000,000 to carry out the fifth increment (that of the fiscal year of 1932)." This would be an increase of $23,000,000, or more than 60 per cent, over any appropriation ever made for the Army Air Corps in time of peace.

The testimony presented by General Fechet and his officers revealed a shortage in Air Corps personnel, but the deficiency there is less acute than in equipment. On Sept. 30, 1929, the Air Corps had only 1,044 regular officers, of whom 935 were airplane pilots, against an originally planned total figure of 1,181 as of approximately that date. General Fechet gave it as his personal opinion that the Air Corps should have at least 2,500 officers in time of peace. At the time of the hearing early in December there were but 21 enlisted airplane pilots in the Air Corps and a decrease to about fifteen by the end of the present fiscal year was predicted, although about 70 enlisted pilots were to be on hand at that time according to the original program. General Fechet declared that it was proving impossible to hold enlisted men in the service against the appeal of commercial employment after they had completed their flying qualifications.

The discussion of plans for the Air Corps Reserve assumed a particular interest in the light of the criticisms recently publicly made by Lieut. (Reserve) C. B. Allen of New York City. It will be recalled that Lieutenant Allen protested against the Air Corps policy of refusing to allow Reserve officers to use planes of service or combat type. The hearings show the Air Corps sticking to its guns, as it was explained that whereas only 67 per cent of the Reserve flying has been done in training planes during the past year, for the coming year it was planned to increase that proportion to 80 per cent. The committee called special attention to this tendency in its report submitting the bill, but without either favorable or unfavorable comment. The extended use of training types will reduce unit cost so that the Reserve will be able in 1931 to have 22,770 hr total flying time as against about 15,000 for the present year, and yet will be able to make an actual reduction in operating expenditures.

Regular Army Planes Total 1,304

General Fechet informed the Committee that as of Oct 1 there were 3,161 pilots listed in the organized reserve, but that only 1,064 were considered as qualified for immediate service in the field, while 751 more could be prepared for active duty by comparatively brief refresher courses.

The hearings on personnel, as indeed those on all other subjects as well, were marked by a highly belligerent attitude on the part of Representative R. A. Collins of Mississippi, member of the Committee, who was unflaggingly persistent in the endeavor to lead all the Army witnesses into admission of contradiction or falsehood.

Some light was shed upon the Army's reason for preferring to restrict most of the Reserve officers to training planes by the figures given upon comparative accident rates, showing that whereas regular Army pilots had been flying approximately 6,000 hr for every fatality, the Reserve figure was approximately 1,700, a fatality rate 3½ times as high as for the regulars, and nearly three times as high as for flying cadets under training.

The equipment statements given during the hearings showed a total of 1,364 planes on hand for the regular Army and Reserve and 153 for the National Guard on June 30 last, with an estimated increase to 1,402 in the first figure and a drop to 146 in that of the National Guard by the end of June. The number actually on hand Oct. 1, 1929, was 1,464 (including those for the National Guard), of which only 1,007 were in a serviceable condition while 274 more were repairable.

During the past year there were purchased a total of 285 new airplanes. In 1930 341 are to be bought for the regulars and reserves, and the bill reported by the Committee provides for the purchasing of 442 planes in 1931, although at average prices in some cases considerably lower than in 1930. General Fechet explained to the Committee that these cuts in unit cost have been forced upon the Air Corps by the Bureau of the Budget.

In detailing his procurement policy the Chief of the Air Corps remarked that contractors, according to his belief "tried to get about 25 per cent [profit on orders] which is a reasonable operating percentage." This is a liberalization of the tendency to enforce a flat maximum 15 per cent profit which has at times been manifested in the past. General Fechet went on to explain that if the project showed any excessive profit, such as 50 per cent, a contractor would be compelled to restore his excess gains to the government in some indirect form.

Of the $2,724,873 in the bill for new construction at Air Corps posts the largest amount goes to Langley Field, Virginia, which receives $835,590 including $524,590 for eight new hangars. Randolph Field, San Antonio, Duncan Field, Tex. and Maxwell Field, Ala., stand to receive between $258,000 and $500,000, mostly for hangars and shops.

By request of the Committee General Fechet discussed some of the most important technical developments recently accomplished by the Air Corps. Conspicuous among them was the use of a red filter with a very sensitive plate for air photography making it possible to take photographs through haze and even through clouds by rays of light invisible to the eye; a triangular parachute giving a steadier descent and slower one than the existing service type; improvement in night photography to the point where it has become a reliable and practical instrument for ordinary service; and the introduction of the two-seater pursuit plane (planned for the immediate future), and of further work on radio controlled aerial torpedoes. In connection with this last work General Fechet said that it had already been possible to maintain some control over the flight of the torpedo up to a distance of 80 mi.

One result of the sometimes prolonged colloquies between Representative Collins and General Fechet was the formal approval by the General of the idea of a united air force. In reply to the question "General, with the amount appropriated or that will be appropriated for the Army and Navy air services, if these activities were consolidated, would we have a more efficient air service without the expenditure of additional funds," General Fechet said, "That is a matter of opinion, Mr Collins———. I believe we could——— In my opinion I believe that with that money an efficient aerial defense of the United States could be provided, and the way the money is being expended now I do not think we have an efficient aerial defense."

Bowlus Soars For 5 Hr. 27 Min.

SAN DIEGO (CALIF.)—Making the longest soaring flight recorded in the United States and more than doubling his own previous record, W. H. Bowlus, builder of the now famous Bowlus sailplane, recently soared above Point Loma, near this city, in an unofficial flight of 5 hr. 27 min. 13 sec. The latest flight cannot stand as official because Bowlus did not carry a barograph, none being available at the time of takeoff, and because the point of landing was below that of the takeoff. A feature of the latest record was that Bowlus had competition for an hour and a half in the form of Jack Barstow, a graduate of the Bowlus Glider School, who flew a glider identical with that flown by Bowlus, in an effort to surpass the effort of his instructor. Bowlus' official record is 2 hr. 47 min. 13 sec.

Second Buffalo Show in March

BUFFALO (N. Y.)—Plans for the 1930 aviation show at Buffalo are progressing satisfactorily under the management of Edward F. O'Dea, head of the Buffalo Aviation Show Co. The second annual show will take place sometime during the month of March. The show is scheduled to be held in the Broadway Auditorium, the city's largest municipal structure conveniently within a short walk of the downtown hotels and shopping district. The aero committee of the Buffalo Chamber of Commerce and the Buffalo Aero Club are cooperating.

Pitcairn in New Plant

ABOVE IS SHOWN the new general offices and plant of Pitcairn Aircraft, Inc., Willow Grove, Pa. The company, formerly located at Bryn Athyn, Pa., has completed removal to the new base where Autogiros and Super-Mailwings will be manufactured.

The plant, which cost about $200,000 and took approximately six months to build, is 150 ft. by 375 ft. in size. Offices are situated in the front section of the factory shown here facing the parked cars. The long white building to the right of the plant contains the dope shop and garages for employes, and in the background are shown two hangars bordering on the flying field.

Pioneer Firm to Make Paulins

BROOKLYN (N. Y.)—The Paulin level flight indicator, a sensitive precision altimeter and checking barometer, is to be built here by the Pioneer Instrument Co., it has lately been announced. The device, designed to furnish a pilot with continuous warning of deviations from a predetermined altitude is sealed from 25 to 20,000 ft. and varies from the usual type of altimeter in that luminous indicators move into position only when the plane is flying at the level chosen by the flier before taking off. (A feature article on the Paulin system is contained in the Feb. 16, 1929 issue of AVIATION, while a description of the improved indicator appears in the Buyers' Log Book section of the Oct. 12, 1929 issue—Ed.)

Women Pilots Number 129

WASHINGTON (D. C.)—The total number of licensed women pilots has now reached 129. Eleven of these are Transports, fourteen Limited Commercials, and the remaining 104 Private pilots.

Aero Develops Service Platform

LOS ANGELES (CALIF.)—The Aero Corporation of California, this city, has developed a servicing platform which is used to enable mechanics to work around all three power plants of a tri-engined plane without the use of ladders and scaffolding. The new platform is about three feet high and is mounted on rollers so that it can be pushed up to the front of the plane and provide a working platform extending almost completely around all three engines. The service platform is equipped with work benches, tool boxes, waste containers and other accessories incident to routine engine servicing.

HIGH POINTS in the NEWS

▶ *Fulfillment menaced?* "The Five Year Program is not a hard and fast schedule which must be adhered to rigidly," says report made to House by Committee of Appropriations. Army Air Corps fund identical with that named by Budget Bureau is recommended.

▶ *"One for all, all for one."* Members of Manufacturers Aircraft Association band to act jointly in cases of threatened infringement litigation based on patents not owned by members.

▶ *Westward.* Moth plant will be moved from Lowell, Mass., to St. Louis, Mo.

▶ *More figures.* Detroit district production for 1929 put at $22,000,000, an increase over '28 of more than $10,000,000.

▶ *Cut.* Consolidated slashes $1,000 from price of Fleet plane. Firm decides to abolish distributors and work directly with dealers, who will now get 25 per cent discount.

▶ *Too bad it was unofficial.* Bowlus keeps glider in air 5 hr. 27 min.—but he had no barograph and furthermore he landed below point of takeoff.

▶ *Wing clipping.* Oregon edict will ground all planes not licensed by February.

▶ *Colorful event under way.* Miami's All American Air Meet begins, new Municipal Dirigible Airport dedicated Monday.

▶ *Pay change.* Curtiss-Wright Flying Service announces new pilot wage scale. Base pay is considerably higher; flying time rate is lowered.

▶ *Going, going . . .* Henderson reports little space unassigned for St. Louis Show.

▶ *Plans many Juniors.* Stinson prepares to turn out 300 of that model in next four months.

Airports and Airlines

▶ *Lower than crack trains.* T.A.T.-Maddux chalks up $159.92 fare on New York-Los Angeles air-rail route—a reduction from $267.42. Also announces cut from $.12 to $.05 a mile between all regular stop cities.

▶ *Results.* W.A.E. reports 620 person traffic on San Francisco-Los Angeles line with new low rates in effect for two weeks ended Dec. 31. Is better than record of any other entire month.

▶ *More places to land.* Aero Branch says country's airports number 1,561, an increase of 41 over October total.

Foreign

▶ *And subsidies too.* Cutting practice extends to Germany, where curtailment of federal air funds threatens to make things difficult for lines.

All American Meet Opens at Miami, Fla.

New Dirigible Airport Dedicated on First Day

MIAMI (FLA.)—The All American Air Meet opened at this city on Jan 13 as AVIATION goes to press The morning of the first day was given over to the dedication of the new Municipal Dirigible Airport, the winter base of the Goodyear blimps, Defender and Puritan The ceremonies included welcoming addresses by Gov Doyle E Carlton and Mayor C H Reeder, and a response by P. W Litchfield, president of the Goodyear Zeppelin Corp Following this came a review of the blimps, air maneuvers, and an inspection of the hangars and ships

Monday afternoon the aerial events were started with a 15 mi race for cabin planes During the afternoon races were held for open planes, light planes and service machines Exhibitions were given by Army bombers, parachute jumpers, and balloon busters. At 7 p m a dinner and informal dance were tendered to the visiting aviators at Coral Gables Previous to the dinner Gov. Carlton opened the first meeting of the newly formed Florida State Aeronautical Association

Aviation Ball Scheduled

During the second and third day of the meet Monday's events are scheduled to be repeated Tuesday evening a combined industrial and aviation dinner were to be held Early during the evening the National Society of Automotive Engineers, headed by J. A. Underwood secretary of the organization, William B Stout, of the Stout D & C Company, and Clarence M Young, assistant secretary of the United States Chamber of Commerce for Aeronautics were to hold the first conference on their annual convention

On Wednesday evening, after a banquet at 7 o'clock, all prizes will be awarded in the stadium at Bayfront Park This will be followed by the grand finale, the Miami Aviation Ball, starting at 10 and lasting until morning.

West is Represented

All the races are being held at the Municipal Airport The Meet is being run with the newly proposed David H Matson plan of organization with cooperation of radio, lights and electric signals, promising to make the affair run like clockwork Miami airport facilities easily take care of the 350 planes, contesting planes being parked at the municipal field while other visiting planes are provided for at nearby fields This permits visitors and factory representatives to fly without interference at any hour of the day without crossing areas in use by racing planes A large delegation from the Middle West is here and the far West also is represented.

The period of the Miami All American Air Meet will also witness the dedication of Miami's new expansion program, which includes the Curtiss hangar and administration building, the Curtiss Marine Base the New York Rio & Buenos Aires Line, the Stout D & C Airlines, and the Viking Seaplane base

Jan 16 will see the beginning of the Florida State Wide Air Tour beginning at Miami and ending in Jacksonville Many planes leaving immediately after the races will join this aircade Landings will be made at various Florida airports throughout the state, according to the plans

Cessna Receivership Denied

WICHITA (KAN)—Receivership proceedings for the Cessna Aircraft Co., instituted by Frank Munoz, a stockholder, have been dropped Judge I N Williams of district court indicated he would sustain the demurrer hence the petition was withdrawn Munoz brought the action on the grounds of mismanagement by C. V. Cessna president of the concern but Judge Williams asserted such a matter should be settled among the stockholders and not in court Though testimony was heard that Clyde V Cessna president, was exerting too much influence in the management of the firm, the Judge stated that in his opinion Cessna was entitled to exert such influence.

Consolidated Spares Ordered

BUFFALO (N Y)—New orders for spare parts totaling $12 200 have been received by the Consolidated Aircraft Corp. from the Army and Navy

Warner Heads S.A.E.; Vought, Leighton Named

NEW YORK (N. Y)—Announcement is made here of the annual election of officers of the Society of Automotive Engineers for the year 1930 Edward P Warner, Editor of AVIATION, formerly Assistant Secretary of the Navy for Aeronautics has been elected president, while Chance M Vought, of the Chance Vought Corp, and Bruce G Leighton, director of sales and service, Wright Aeronautical Corp, are among the vice-presidents named

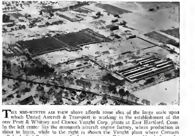
Some seven thousand leading automotive engineers and executives are now included on the Society's roster American leadership in auto transport fields has been maintained through the work of these men in the design, standardization, and production of motor cars, motor coaches motor trucks, motor boats, motor cycles, diesel engines, and internal-combustion power plants generally

The Society of Automotive Engineers will celebrate its quarter-century anniversary this Summer

General Cable Buys Peerless

PENNINGTON (N J)—The Peerless Insulated Wire and Cable Co., this city, has been purchased by the General Cable Corp, maker of electric cables suitable for airport use The plant here will be continued as a part of the Standard Underground Cable Co, division of the General Cable Corp.

Wasp and Corsair Homes Viewed From the Sky



THE MID-WINTER AIR VIEW above affords some idea of the large scale upon which United Aircraft & Transport is working in the establishment of the new Pratt & Whitney and Chance Vought Corp plants at East Hartford, Conn In the left center lies the mammoth aircraft engine factory, where production is about to begin, while to the right is shown the Vought plant where Corsairs will be built following removal of equipment in February or March from the firm's present Long Island City quarters The level tobacco land shown in the upper right hand corner of this photo will be developed into an airport to be operated by a United Aircraft subsidiary

A. C. of C. Will Meet To Elect New Governors

NEW YORK (N.Y.)—The Aeronautical Chamber of Commerce will hold a meeting at their offices 10 E. 40th St Jan. 25 for the purpose of electing Governors for 1930, for voting upon a proposed amendment to the by-laws, and for general business The meeting will begin at 10 30 a m

The Governors will be elected by the various classes of members Those nominated for the class "A" Governors are Louis H. Mueller, Seattle, Varney Air Lines, H M. Hanshue, Los Angeles, Western Air Express and Fokker Aircraft Corp., Paul Henderson, Chicago, National Air Transport and Transcontinental Air Transport, E. L. Cord, Auburn, Ind., Stinson Aircraft Corp, F B Rentschler Hartford, Pratt & Whitney Aircraft Corp Charles L Lawrance New York, Wright Aeronautical Corp, G B Grosvenor New York, The Aviation Corp, J T Trippe New York Pan American Airways, Inc.; W G Skelly, Tulsa, Spartan Aircraft Co., Carl S Reed, New York, Fairchild Aviation Corp

The nominations for the class "B" Governors are E. E. Aldrin, New York, Gilbert & Barker Mfg Co J C Hunsaker Akron, Goodyear Tire and Rubber Co., Frank H Russell New York, Curtiss Wright Flying Service, Charles H. Colvin, New York, Pioneer Instrument Co, E. E. Wilson Pittsburgh, Hamilton Standard Prop Co, S L. Gabel, Bridgeport. Penna Summerill Tubing Co, J. R. Fitzpatrick, Chicago, Haskelite Manf Co J R Cautley, South Bend Bendix Brake Co For class "C" Governor P G Kemp Chicago Central Air Terminal Co is the sole nominee E S Evans Detroit National Glider Assn and Luther K Bell, New York, Aeronautical Chamber of Commerce of America, are the nominees for associate and sustaining members, respectively

Officers up for Election

The new Board of Governors, will vote on the following officers President, F. B Rentschler Geographical vice-presidents Northwest Louis H Mueller Seattle, Southwest H M Hanshue Los Angeles South Central W. G. Skelly, Tulsa; North Central Paul Henderson, Chicago East Central E. S Evans, Detroit Northeast, G. B Grosvenor New York Southeast, J. T Trippe, Miami The following are nominated for the Executive Committee Messrs C L Lawrance, J C Hunsaker, F B Rentschler H M Hanshue, C H Colvin G B Grosvenor, L K Bell For treasurer Col B. F Castle, Great Lakes Aircraft Corp Cleveland For Secretary John R Cautley South Bend and Luther K. Bell for General Manager

The proposed amendment to the by-laws has for its purpose the enlargement of the executive committee of the Aeronautical Chamber of Commerce from five members to seven members

Increase Reported by A.P.C.

DETROIT (MICH.)—Business done by Aircraft Products Corp, Detroit manufacturer of shock absorbers tail wheels, skis and floats, showed a 1929 increase of 698 per cent over business done during the nine months of its existence in 1928, according to Ralph R Irwin president Aircraft Products Corp at the same time announced an order from the Canadian Department of National Defense for two sets of the company's shock absorbing ski pedestals One is for a Ford tri-engine the other for a Fairchild

Must License Oregon Airplanes by February

PORTLAND (ORE.)—All airplanes in Oregon which have no federal licenses must by February obtain state licenses and airworthiness certificates or stay on the ground according to an edict just issued by the State Board of Aeronautics Any plane which fails to obtain both license and certificate will be grounded indefinitely. The order is the most stringent one issued since the decision of the board to enforce all state aeronautical statutes strictly

Rules adopted by the Board for carrying out its order include the following

All planes flown commercially or for pleasure must be inspected by one or more members of the Board before a certificate will be issued.

In the event of an accident the certificate will be revoked if damages are of a serious nature A new certificate will be granted when the Board is convinced satisfactory repairs have been made

Failure to comply with all of the rules will result in cancellation of the certificate. Similar action will be taken if a pilot does any flying which the Board deems unsafe both to the pilot and the public

The Board maintains its headquarters at Portland Airport to which applications for inspection are to be made

Fleet Reduces Price; Modifies Sales Policy

NEW YORK (N Y)—A reduction of $1 000 in the price of the standard Kinner Fleet training plane is announced by the Consolidated Aircraft Corp The plane, which has been selling for $4 895 will hereafter sell for $3,895 flyaway Buffalo

This is the second reduction made by the Fleet company within the past year and is in line with its policy 'of bringing the sport plane within reach of the general buying public"

In line with this policy is the company's decision to abolish distributors for its planes and to concentrate on a system of selling through dealers The rate of discount to dealers is to be increased from 20 to 25 per cent, it is announced

M. A. A. Organized Against Patent Suits

Members to Act Jointly On Claims of Infringement

NEW YORK (N Y)—The board of directors of the Manufacturers Aircraft Association, Inc., at the January meeting authorized a plan for the effective organization of its members for joint action in connection with threats of patent litigation based upon patents not owned by its members.

"This action," says the statement given out by the Association, "is the direct result of certain threatening claims which have recently been made quite generally throughout the industry, covering patents of unknown or questionable value

"While the Association strongly believes in patent protection and compensation for meritorious inventions, it is just as strongly opposed to unnecessary patent litigation or to the idea of patent monopoly in the industry As the result of the Association's Cross-License Agreements the commercial manufacture and sale of airplanes in the United States has thus far been practically free from patent litigation."

History of the Organization

The Association was formed twelve years ago, and since that time, more than 22,000 airplanes have been built and licensed in the United States under 38f patents owned by its members, including the basic Wright and Curtiss inventions At present 44 companies are licensed to use the patents, and the Association is now negotiating for membership and licenses with practically all the other producers of planes

The U. S. government likewise has obtained licenses, through the Association, under the patents covering all planes manufactured in government plants or purchased from foreign or other unlicensed manufacturers

The directors and officers of the Association are as follows Frank H Russell president J. Don Alexander, vice president Harris M Hanshue, vice president E. S Evans, treasurer, Walter S Davis, secretary, S S. Bradley general manager, assistant secretary, and assistant treasurer, and Lloyd Stearman, and Chance M Vought

Two Swallows to Alaska

WICHITA (KAN)—Two planes fitted for cold weather flying are being shipped by the Swallow firm here to Joe Crosson and C. H. Gillam, at Fairbanks, Alaska Crosson and Gillam deal in planes and operate a flying school One of the machines is a J 5 biplane while the other is a training plane. Both cockpits of each are equipped with heaters and other equipment for cold weather work.

Detroit '29 Production Valued at $22,000,000

DETROIT (MICH)—During the year 1929, Detroit produced approximately $22,000,000 in airplanes, airplane engines, and aeronautical parts, according to figures made public here by the Aircraft Bureau of the Detroit Board of Commerce. Although the Board's report essayed no comparison with 1928, it is estimated that the 1929 figure exceeds that of the preceding year by more than $10,000,000.

In its review of production, the Board places a $7,000,000 aggregate on the value of airplanes, $5,000,000 on engines, and $10,000,000 on aircraft parts, equipment, material, and other accessories.

The Board's report states that $3,655,000 was spent on aircraft industrial plants here last year, $2,200,000 for airport buildings, and $2,190,000 for airport improvements, exclusive of land costs. In arriving at a figure for plane production the Board considered only the three largest aircraft plants within the Detroit district, i. e., Ford, Stinson and Buhl. The Ford Motor Co produced 97 planes, valued at more than $5,000,000, as against the 1928 record of 51 planes, valued at $2,300,000.

Ford Production Up 45%

The Stinson Aircraft Corp. built 121 planes, total value of which was $1,200,000, compared with 95 planes during 1928. Buhl's production was slightly below that of 1928. Their 1929 output was 30 planes, valued at $450,000. The Ford production increase was figured at about 45 per cent and the Stinson increase at 12½ per cent.

Although the figures were not made public, it was said that Packard led the local field in the realm of engines. Warner, with 340 engines, greatly exceeded its initial year's production. Continental, which is just entering the airplane engine market, and American Cirrus, which located in the Detroit district considerably less than a year ago, were not figured in the total.

List Various Projects

Ford's new $500,000 addition tops the list of plant expansions, although this is followed closely by Packard's new diesel engine plant, Stinson's new factory building, Buhl's airport development, Warner's new plant, and building projects by American Cirrus, Ex-Cello, Curtiss-Wright and Schlee-Brock. The City of Detroit's newly completed $1,000,000 hangar and terminal building at City Airport heads the list of 1929 airport buildings. It was estimated that the City spent $760,000 in airport development, the county $850,000, the Ford Motor Co $105,000, the Detroit Aircraft Corp $400,000, and the Detroit-Wayne Industrial Airport Corp (owner of the Stinson Airport) $75,000. The report does not include smaller expenditures made on any of the ten additional airports and flying fields in Detroit and its environs.

The Board presents a thumb-nail picture of the city's aircraft industry by stating that Detroit's immediate vicinity contains six manufacturers of heavier-than-air craft, and ten more still in the experimental stage, one lighter-than-air craft company, four airplane engine makers, 54 manufacturers of airplane parts, equipment and materials, 35 branch supply houses, and fifteen airplane distributors and dealers.

Maximum Safety to Mexico

LOS ANGELES (CALIF)—Bankruptcy proceedings which have been pending for several months against the Maximum Safety Aircraft Co, of this city, have been dismissed following the arrangement of a creditors' extension agreement signed by more than three-fourths of the creditors. Operations are shortly to be resumed by the company in a new factory location projected for the vicinity of Tia Juana, Lower California, Mexico. It is understood that a considerable contract is now held for the construction of two place training planes for the Mexican Army. Work will also continue on the perfection of the Maximum Safety cabin plane which was widely test flown in this vicinity several months ago. Officers of the company are given as James MacDonnell, president, and D J S McBirnie, vice-president.

Insurance Firm Rider Approved

ALBANY (N Y)—Approving an order of the Appellate Division, Third Dept, which requires Arthur Conway, State Superintendent of Insurance, to approve an aviation rider which the Metropolitan Life Insurance Co sought to attach to its policies, the Court of Appeals has concluded its review of the case. The insurance company had sought to place the rider in the limitation clause of their policies (AVIATION, Dec. 14). With the rider attached, it will now be possible for pilots and others engaged in the aviation industry to secure insurance at regular rates.

The new clause, briefly, will allow full payment of a policy if death results from natural causes. In case of death occurring in connection with any aviation work the reserve only will be paid. Traveling as a paid passenger in a plane is not considered aviation work.

Army Fliers at Minot; Group Narrowed to 17

MINOT (N D)—With five of the 22 starters forced down, the First Pursuit Group of the Army rested here. After a day's delay, the "Arctic Patrol" got under way from Lake St Claire on Jan 10 and flew on schedule to Duluth, Minn, the first overnight stop. Seventeen planes reached Minot on the following day. Five stragglers were forced down in various parts of Michigan, Minnesota, and North Dakota, engine trouble and broken skis being responsible. Three of the delayed planes reached Minot during Jan 12, on which day the flight should have been continued to Great Falls, Mont., but owing to varied trouble and a desire for all to proceed together again the machines were held over a day.

The Army fliers met with unlooked for difficulties even before the flight began. Due to unseasonably warm weather, Selfridge Field was in a soggy condition so the planes were flown to Lake St. Claire where the wheels were replaced with skis for use throughout the trip. Upon the completion of this operation rain fell, resulting later in a heavy coating of ice on the planes. The ice was chopped away next morning. During the ski fitting job the Ford which carried the radio equipment broke through the ice of the lake and was only saved from damage by the ground crew from Selfridge which worked all night.

The flight is being undertaken to test many pieces of equipment and to show the feasibility of pursuit operation in zero weather conditions. Among the new accessories are engine covers heated with a small gasoline lamp, hand warmers consisting of a sack filled with a chemical compound, and skis specially constructed for the flight work. Three of the planes are using air-cooled engines, the others being equipped with Prestone to care for temperatures to 40 below zero.

Personnel Described

Maj. Ralph Royce, flight commander at Selfridge, is in command of the group. The personnel participating in the trip are twenty commissioned pilots, two non-commissioned pilots, sixteen enlisted men (including mechanics, radio-operators, and camera men) and H. J. Adamson, representing F Trubee Davison, Assistant Secretary of War for Aeronautics. Mr Adamson is broadcasting the flight reports from the radio plane. These reports are being relayed by the Amateur Radio League of America and the General Electric Co through its short wave station at Schenectady.

Timken Firm Buys Ford

CANTON (OHIO)—An order for a Ford plane has been placed by H H Timken, president of the board of the Timken Roller Bearing Co, this city. The new plane will be used extensively in Timken business.

Ludington to Distribute Curtiss-Wright Aircraft

PHILADELPHIA (PA.)—Ludington Philadelphia Flying Service, operating at Philadelphia Airport and Central Airport, Camden, has become distributor in eastern Pennsylvania, southern New Jersey and Delaware for Curtiss-Wright Sales Corp, according to an announcement made recently by C T Ludington, president.

At the time the distributorship was taken over, the Ludington company placed an order for 43 airplanes and equipment totaling $325,000 in retail sales value. During 1929, the Ludington company sold 44 planes, and in the previous year, 68.

The new sales hook-up has become increasingly logical during the past year. Last spring Ludington took over the Travel Air agency, and the officials and backers of the company are almost all directors or stockholders in various Curtiss-Wright affiliations.

Flight instruction is going on both at Philadelphia Airport, the Ludington headquarters, and at Central Airport which houses the ground school operated by the Ludington company. Consolidated Fleets are being used for instruction, and the new agreement is said to specify addition of Curtiss Robins and Fledglings for training purposes.

The Wright service shop, heretofore at Philadelphia Airport, probably will be moved to a building of its own at Central Airport. Sales, taxi and short passenger operations will continue at both fields, and a central Philadelphia sales and display room is to be leased by the Ludington company with a ticket office included.

The officers and officials of the Ludington company will remain as in the past. C Townsend Ludington is president and treasurer, R Sanford Saltus, Jr, vice-president, W Wallace Kellett, secretary, Robert P Hewitt, general manager, J C. Newlin, Jr, assistant general manager at Philadelphia Airport, E. W Day, Jr, operations manager at Central Airport. W Sanger Green is general manager of Central Airport.

Lindbergh Gets New Lockheed

BURBANK (CALIF)—Col Charles A Lindbergh and Mrs Lindbergh have taken delivery on their new Lockheed "Sirius" low-wing monoplane at the United Airport near here. Mrs Lindbergh accompanied Col Lindbergh on his first flight in the new plane, approximately an hour in length. Lindbergh expressed himself as well satisfied with the new plane which is the first of a new line now offered by the Lockheed company. The "Sirius" is built with two cockpits, equipped with dual controls, and has a fuel capacity sufficient for flights in excess of 24 hr. Power is supplied by a 425 hp Wasp engine enclosed in an N A C A. cowling.

Designing New Command-Aires

LITTLE ROCK (ARK)—Command-Aire, Inc, this city, has closed its plant temporarily, and special time and attention is being given by the engineering department to the development of new model planes. R B Snowden, president, states that present plans call for the reopening of the factory about April 1, and possibly sooner. Directors were told that the firm moved 240 planes during 1929. A new reduction in price is planned in Spring.

Approve Wasp Junior

PRATT & WHITNEY Aircraft Co received an approved type certificate for the new "Wasp Junior" power plant last week following 10 hr of test flying with the first production engine installed in a Vought Corsair. The flights were made by Test Pilot A. Lewis MacClain. Shown above in a picture taken at the time of the trials are, left to right: William P Gwinn, sales engineer, Pilot MacClain, A D V Willgoos, chief engineer, and L S Hobbs, experimental engineer in charge of tests.

Representatives Named

ACE MANUFACTURING CORP, Wichita, Kan—C R Moore, Owatonna, Minn. He has accepted delivery on the first "Baby Ace" plane built by the new Wichita company, a single-place, sport cabin plane.

KINNER—Northwest Air Service, Inc, Bryn Mawr, Wash, regional distributor, will maintain a stock of engine parts and repair service facilities for Kinner powered craft.

ARROW—Edwards Motor Co, Lexington, Ky.

Cessna to Offer Gliders

WICHITA (KAN)—The Cessna Aircraft Co has definitely announced that it will undertake commercial production of gliders after the original design of Eldon Cessna, son of C V Cessna, head of the company. The model will be of wood and fabric. It is to sell for less than $400.

Little Show Space Remains at St. Louis

To Display Nearly 100 Planes; Plan Extravaganza

ST LOUIS (MO)—With the receipt of reservations from nearly all of the leading manufacturers and aircraft groups in this country for space at the International Aircraft Exposition scheduled for Feb 15-23 and sponsored by the Aeronautical Chamber of Commerce of America, Cliff W Henderson, manager of the show, announces that very little exhibition area remains unassigned.

Exhibitors will occupy more than three hundred booths in the two wings of the Arena, and will display a most complete line of aircraft engines, accessories, etc. Approximately one hundred planes will be placed in the center sections of the buildings and will constitute a brilliant presentation.

Aside from the booth and airplane exhibits there will be included in the daily program a pageant depicting the history of transportation to be followed by an extravaganza which will take place on a large stage to be constructed along one side of the Arena's central building. Seating facilities will accommodate approximately twenty thousand people, it is asserted, and a record attendance for an exposition of this kind is expected.

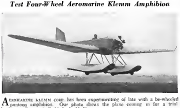
Many Meetings Planned

Particular attention, according to Henderson, general manager for the exposition, will be paid the scheduled conferences and meetings between the various component sections of the Aeronautical Chamber of Commerce. During the nine days of the exposition there are sixteen individual and joint gatherings of the Chamber groups, from which it is expected many constructive developments for the welfare and growth of the air industry will be programmed. The Commercial Airplane Manufacturers, Motor Manufacturers, Air Transport, Flying School, Airport, Distributor-Dealer, Accessory-Material, Fuel-Lubricants and Finance-Insurance sections are groups of the Aeronautical Chamber which will meet, aside from joint sessions with the Society of Automotive Engineers and the Bureau of Aeronautics of the Department of Commerce.

Upson, Wilson to Address S.A.E.

DETROIT (MICH)—The annual Society of Automotive Engineers meeting will include the aeronautic session on Tuesday, Jan 21, at 8 00 P M. "The Metalclad Airship—Past Adventures and Future Prospects," will be the topic of Ralph Upson, aeronautical engineer, and Comdr. E. E Wilson, of the Standard Steel Propeller Co will talk on "The Importance of Dependability in Aircraft Engines." C. E. Fritsche, Detroit Aircraft Corp., will act as chairman of the session.

Test Four-Wheel Aeromarine Klemm Amphibion



AEROMARINE KLEMM CORP has been experimenting of late with a be-wheeled pontoon amphibion. Our photo shows the plane coming in for a trial landing at Roosevelt Field, L. I., N. Y.

Report Initial Entries In Pittsburgh Air Show

PITTSBURGH (PA) — Seventeen planes have been entered during the first week of active work in the second annual Pittsburgh Aircraft Show, to be held from March 6 to 15 inclusive. Capt. William J. Austin, director of sales for the Pittsburgh Aviation Industries Corp., has been named general chairman of the show committee, and Capt. E. C. Speer has been appointed show sales manager. The list of planes includes the Davis monoplane, Doyle monoplane, Consolidated Fleet biplane, Thaden all-metal monoplane, Barling NB 3 monoplane, Flying Dutchman monoplane, Travel Air monoplane, De Havilland Moth biplane, Cessna monoplane, Curtiss Robin monoplane, Command-Aire biplane, Stinson monoplane, Heath Super Parasol, Eaglerock biplane, two Travel Air biplanes and a Ryan monoplane.

The 1930 show is two days longer than that of last year and using two large floors of the Motor Square Garden, will be one of the largest sectional shows. Several reels of motion pictures and a musical program will be among this year's entertainment features. Recalling the success of the 1929 glider exhibit, Ray Kimmi, director of the show, has arranged a large display depicting the advances of engineless flying during the past year. Show headquarters have been opened in the William Penn Hotel.

The show is being held under the auspices of the Aero Club of Pittsburgh which sponsored the first annual show last year.

C.A.F.C. to Increase Capital

OTTAWA (ONT)—Application by the Compagnie Aerienne Franco-Canadienne to increase its authorized capital from $49,000 to $500 000 will be made in the near future.

Stork Represents Three Firms

NEW YORK (N.Y.)—C. T. Stork Corp., newly-formed with offices at 730 Fifth Ave. and with a hangar and service shop at Roosevelt Field, announces its appointment as Metropolitan distributor of Great Lakes Aircraft Corp. and American Aeronautical Corp. The firm will also represent American Cirrus Engines, Inc., of Marysville, Mich., as Eastern Service Agent. Charles T. Stork, formerly president of Nevadel-Agene Corp., Newark, and the Lucidol Corporation, Buffalo, is president and treasurer, while Ken M. Murray, formerly with Curtiss Flying Service and Great Lakes, is sales manager. A complete line of demonstrators is maintained at the field.

Will Move Moth Plant From Lowell to St. Louis

LOWELL (MASS.)—Official confirmation of the rumor that has been current for several days to the effect that the Moth Airplane factory would be moved to the Middle West has been made by president Minton M. Warren. The plant will be moved to St. Louis, there to be consolidated with the Robin plant of the Curtiss-Wright group. Operation of the Lowell plant will continue into the Fall, although first production of Moths at St. Louis is expected in March.

The Lowell Chamber of Commerce has been assured that the Lowell plant will be used for other activities, possibly for the building of airplane instruments and other accessories. Between April 1 and Dec. 1 of last year the company built and sold 130 planes. Sixteen more are under way and will be completed before removal of the plant.

By the change in location operating economies are promised according to the executive committee of Curtiss-Wright, and a much better countrywide distribution is assured.

More Schools Approved

WASHINGTON (D. C.)—Additional flying schools which have lately been given approved type certificates are as follows: Curtiss Flying Service, Los Angeles Municipal Airport, Inglewood, Calif., ground and flying, Transport, Limited Commercial, and Private licenses; Roosevelt Aviation School, Inc., Roosevelt Field, Mineola, L. I., N. Y., ground and flying, Transport, Limited Commercial, and Private licenses; Universal Aviation School, 344 Exchange St., St. Paul, Minn., in combination with Universal Flying School, Wold-Chamberlain Field, Minneapolis, Minn., ground and flying, Limited Commercial and Private licenses; Curtiss Flying Service of Indiana, Stout Field, Mars Hill, Indianapolis, Ind., ground and flying, Limited Commercial and Private licenses; Universal Aviation School, Memphis Municipal Airport, Memphis, Tenn., ground and flying, Limited Commercial and Private licenses; Garland School of Aeronautics, Tulsa, Okla., ground and flying, Transport, Limited Commercial and Private pilot licenses; Wolf Flying Service, Williamsport Airport, Williamsport, Pa., ground and flying, private licenses; Spartan School of Aeronautics, Apache Blvd. & Chamberlain Drive, Tulsa, Okla., ground and flying, Transport, Limited Commercial and Private licenses; Curtiss Flying Service of South Memphis Municipal Airport, Memphis, Tenn., ground and flying, Limited Commercial and Private licenses; Penn School of Aviation, Pittsburgh-Butler Airport, Butler, Pa., ground and flying, Transport, Limited Commercial and Private licenses; Art Goebel Aviation Co., Inc., 101 West 12th St., Kansas City, Mo., and Liberty Field, Liberty, Mo., ground and flying, Transport and Limited Commercial licenses; Curtiss Flying Service, Bowman Field, Louisville, Ky., ground and flying, Limited Commercial and Private licenses; Curtiss Flying Service, 208 Richardson Bldg., St. Clair St., Toledo, Ohio and Transcontinental Airport, Walbridge, Ohio, ground and flying, Limited Commercial and Private licenses; and Mamer Flying Service, Inc., 320 Paulsen Bldg., Spokane, Wash., and Felts Field, Spokane, Wash., ground and flying, Transport, Limited Commercial, and Private licenses.

Many Inquiries on Beryllium

WASHINGTON (D. C.)—Considerable interest in beryllium as an aircraft construction material is reported by the Bureau of Mines as evidenced by the volume of correspondence brought forth by the recent publication of an information circular on the metal, which is possessed of unusual lightness and strength. Prospecting for beryllium has been stimulated, and it is reported that a sizable deposit of unknown grade has been found in a region of Manitoba, Canada.

Stinson Plans Heavy Production of Juniors

DETROIT (MICH.)—Having contracted for material and accessories valued in excess of $1,000,000, Stinson Aircraft Corp. is preparing to begin mass production, it has been authoritatively stated here.

The company's plan calls for production of 300 four-place Stinson Juniors within the next four months, the planes to be equipped with either the 210 hp. Lycoming, the 225 hp. Wright, or the 225 hp. Packard-Diesel engine. This production will be maintained in addition to a more or less normal output of the company's larger and higher powered Stinson-Detroiters.

The new production policy is a direct outgrowth of the Stinson company's recent amalgamation with the Cord Corp., a subsidiary of which manufactures the Lycoming engine. That the production will be accompanied by an equally sensational sales policy is a foredrawn conclusion. During the whole of 1929 the Stinson firm produced 122 planes, including both Detroiters and Juniors.

Just what changes, if any, will be incorporated in the high production Junior, has not been learned. Several of the bids for material and accessories are still open.

The Stinson firm has contracted with the Lycoming Manufacturing Co., Williamsport, Pa., for 500 engines which are to be delivered by May 1, according to William H. Beal, vice-president of the Lycoming company. The power plants are of a nine-cylinder, radial, 210 hp. type.

New Approvals Reported

WASHINGTON (D. C.)—Two more planes and three more engines have lately been approved by the Aeronautics Branch. The planes are: No. 285—Courier PB-f three-place cabin monoplane, 90 hp. Kinner, weight empty 1,387 lb., useful load 713 lb., gross 2,100 lb., and No. 287—American Aeronautical Savoia-Marchetti (American) S-56, three-place open amphibion biplane, 90 hp. Kinner, weight empty 1,451 lb., useful load 699 lb., gross 2,150 lb.

Engines: No. 37—Michigan Aero Rover four cylinder in-line air-cooled inverted, 75 hp. at 1,975 r.p.m.; No. 38—Lambert R-266 five cylinder radial air-cooled, 90 hp. at 2,375 r.p.m.; and No. 39—Pratt & Whitney Wasp Junior, nine cylinder radial air-cooled, 300 hp. at 2,000 r.p.m.

Navy Adds Airship Insignia

WASHINGTON (D. C.)—Enlisted men who have qualified for service on dirigibles are entitled, according to the new Navy uniform regulations, to wear a replica of a rigid airship on their sleeves. The insignia, representing a dirigible of the "Los Angeles" type, is to be of white silk on blue for blue uniforms and blue on white for white cloth.

Aero Engineering Expands

WICHITA (KAN.) — Necessity for larger quarters has forced the Aero Engineering Service Co. to change its location in this city. A five-year lease has been taken on a new building big enough and well-enough equipped to take care of the more than 300 students now enrolled in the company's welding course. Growth of the company during the past year is responsible for the move, according to S. W. Cooper, Jr., president of the concern.

Schools and Colleges

BOEING SCHOOL OF AERONAUTICS, Oakland, Calif., will open new classes in private, limited-commercial, transport, flying, and airplane and engine mechanics courses on Feb. 15. Twenty-four states, the Philippine Islands, and Mexico are represented in the present enrollment of the school, and two applications have been received from China.

BRALEY SCHOOL OF FLYING of Wichita, Kan., will shortly open a branch school at Alva, Okla.

GREAT NORTHERN AVIATION SCHOOLS, St. Paul, Minn., recently opened its midwinter term. The Aviation Mechanics course has been expanded and the school has established a bureau to assist students to find outside work to help pay for tuition, room and board.

NATIONAL AIRCRAFT WELDING SCHOOL, Kansas City, Mo., has added a course in airplane engines.

PARKS AIR COLLEGE, East St. Louis, Ill., has lengthened its ground school course from nine to ten weeks. Additional courses on engines, rigging, and air commerce law are included in the new curriculum. The school has opened an employment department, in charge of Forrest Cannon, to provide students with jobs.

UNIVERSITY COLLEGE of the University of Southern California has added courses in air law and radio communication to its schedule of aviation subjects.

UTICA FREE ACADEMY houses a class which is being offered by the city of Utica as a part of its night school curriculum. Reginald I. Heath, superintendent of the local airport, is instructor of the class in which more than 85 students are enrolled.

New Army Orders to Richfield

LOS ANGELES (CALIF.)—The Richfield Oil Company of California has just been awarded two additional contracts to supply gasoline to the Army, according to C. M. Fuller, president. The first contract calls for delivery of 326,000 gal. of domestic aviation gasoline to March Field, Riverside, Calif. The second is for delivery of 154,000 gal. of Ethyl aviation gasoline to the Army Field, San Diego, Calif. Both contracts to be completed by June 30, 1930. This company has also just shipped 450,000 gal. of gasoline for Army use in the Canal Zone.

NEW PLANES

Tests are being conducted at Tampa, Fla., on the Corman Airliner by J. C. Kelly, Jack Fortune and Capt. A. B. McMullen. The craft at present uses three Wright J-5 engines, it has a glass-enclosed cabin. The manufacturers are the Cord-Manley interests of Auburn, Ind., producers of the front-drive Cord automobile, the Auburn car, the Dusenburg, and the Lycoming engines. The Tampa Chamber of Commerce is endeavoring to induce the manufacturer to locate in that town, offering a ten-acre plot ajoining the airport there.

The Huntington Aircraft Corp., Bridgeport, Conn., has started work on a two-place cabin monoplane. It will have a wing spread of 35 ft. 5 in., will measure 23 ft. 6 in. from tip to tail, and will stand 8 ft. 4 in. above ground. It will employ a full cantilever wing, with both front and side vision provided for the pilot and passenger, who will sit side by side. A 110 hp. Warner engine will provide the power. Howard Huntington and George Titterton are the designers, and the construction contract has been awarded to the Olsen Aircraft Co.

At Cheyenne, Wyo., a midget plane, known as the "Monstrosity" (commercial candor?), was successfully flown on a round trip to Denver. Much interest was shown in the plane at Denver because of its high aspect ratio. It was built by E. A. Bennett, Boeing mechanic, from specifications of Edward Allen.

The tri-engined "Triad," first plane manufactured by the Saul Aircraft Corp., Carroll, Ia., has been given its trial flights and has proven satisfactory, W. F. Saul, president of the company, has announced. The plane, a four place cabin machine, was built under the direction of Glenn C. Boyer. It was flown by Sid Cleveland.

Union Group Named Globe Aero

KANSAS CITY (MO.)—Announcement is made here that the Globe Aero Service Bureau, a non-profiting voluntary association, is the body through which Dale Jackson and L. H. Atkinson are working for the establishment of their aircraft workers union (AVIATION, Jan. 11). An organization fee of $10 is being charged for membership prior to March 1, after which date the fee will be raised. Money received over organizing expenses will be held for the union. In connection with the Bureau, Globe Aero Securities is being organized to operate as an investment firm for financing planes on the time-payment plan. The company will also offer aircraft insurance to members of the union.

Chile Purchases Ford 5-AT's

DETROIT (MICH.)—The government of Chile has purchased two model 5-AT Ford all-metal monoplanes, the Ford company has announced here.

Glider Association Grows to 29 Clubs

N. G. A. Pledged $35,800 of $300,000 Total Sought

DETROIT (MICH) — A total of $35,800 of the $300,000 sought by the National Glider Association as a sustaining fund to finance its activities during the next three years, already has been pledged, according to an announcement here. The organization's tentative budget calls for expenditures of $25 000 annually for the support of a research organization, $14 500 for scientific equipment, and $10 000 for an annual gliding and soaring tournament. Plans for a national contest to be held next summer are now under way.

The announcement stated that the Association has grown within the past few weeks from an organization of seventeen affiliated clubs to one having 29 affiliated clubs, these being located in thirteen different states. The organization's total individual membership is now 1,050, it was said. The goal is one million glider pilots by the end of 1931. Nine of the 29 clubs are in Michigan. William B. Mayo is president of the Association and E. S. Evans honorary president.

Several Schools Using Gliders

Seven companies now are manufacturing gliders in various parts of the United States, it was said. These companies are: Gliders, Inc., Detroit; Baker, McMillen Co, Akron; Northwest Aircraft and Motor Co, Seattle; Clarence N. Cook, Kansas City; American Sailplane Co, Lynn, Mass; Heraclio Alfaro, Cleveland, and Mattley Airplane Co, San Bruno, Calif.

Several large flying school operators, including Curtiss-Wright Flying Service, of Michigan, and Parks Air College, East St. Louis, have purchased gliders to determine their value in student-training.

Following is a complete list of the glider clubs now organized, the first eleven of which are newly affiliated:

Clubs Listed

Cincinnati Girls' Glider Club, Cincinnati, Ohio; Air Scouts of America, Squadron No 1, Detroit, Mich.; Fernandine Glider Club, Fernandine, Fla.; Washington Glider Club, Washington, D. C.; Bowlus Glider Club, San Diego, Calif.; Philadelphia Glider Club, Philadelphia, Pa.; Lindsay H. S. Glider Club, Lindsay, Calif.; A B C Glider Club, Detroit, Mich.; Detroit Glider Club, Detroit, Mich.; Syracuse Glider Club, Syracuse, N. Y.; Niagara Falls Glider Club, Niagara Falls, N. Y.; California Glider Club, San Francisco, Calif.; Dearborn Glider Club, Dearborn, Mich.; Glider Section of Aeronautical Society of University of Michigan, Ann Arbor, Mich.; New York Glider Club, Whitestone, N. Y.; Cleveland Glider Club, Cleveland, Ohio; Cincinnati Glider Club, Cincinnati, Ohio; Breckenridge Glider Club, Breckenridge, Tex.; Seattle Glider Club, Seattle, Wash.; Rochester Glider Club, Rochester, N. Y.; Kansas City Glider Club, Kansas City, Mo.; Jackson Glider Club, Jackson, Mich.; Portland Glider Club, Portland, Ore.; Highland Park Glider Club, Detroit, Mich.; Hillsdale Glider Club, Hillsdale, Mich.; Columbus Glider Club, Columbus, Ohio; Prop & Wing, Chicago, Ill.

Plan Aero Insurance Lectures

NEW YORK (N. Y.) — Under the auspices of the Insurance Society of New York, three lectures on aviation insurance will be given in the board room of the New York Board of Fire Underwriters on Feb. 7, 14, and 21 at 12.15 o'clock. The speakers and their subjects follow: hull insurance by Reed M. Chambers, vice-president of the United States Aviation Underwriters; aviation insurance from the life and personal accident angle by Dr. Lawrence G. Sykes, medical director of the Connecticut General Life, and legal liability of owners and operators of aircraft by Henry G. Hotchkiss of Cuthell, Hotchkiss & Mills. Admission to these lectures will be to members of the Society only.

Amassed 1,120 Hr. '29 Time in Goodyear Ships

AKRON (OHIO) — One of the best records ever compiled by a pilot of a lighter-than-air craft is revealed by the log book of V. L. Smith, a member of the airship personnel of the Goodyear Zeppelin Corp. Smith was in the air 1,120 hr. and 46 min. during the year 1929, an average of more than 93 hr. a month. This is especially unusual when it is considered that Smith seldom flew on Sundays and that flying was impossible many days of the year. During his 1,120 hr. Smith has covered 51,678 mi. and carried 2,044 persons on their first lighter-than-air flights. A fact worthy of note is that Smith has flown through rain, fog, snow and practically every conceivable kind of weather. On one occasion he took off in a snow storm for an objective 300 mi. distant and arrived just five minutes before the time he predicted.

V. L. Smith

The log book shows that Smith has made 1,178 landings and as many take-offs. Flying out of Aberdeen, Md., he flew fourteen out of fifteen days and averaged 8 hr. in the air daily. At Atlanta, Ga., he flew 156 passengers in 3 hr. 56 min. on one occasion. Smith is 31, married, and his home is at Akron, Ohio.

Curtiss-Wright Pilots' Wage Scale is Modified

NEW YORK (N. Y.)—Curtiss-Wright Flying Service, through Maj. E. H. Brainard, vice-president, recently announced the new scale of wages under which the firm's pilots will fly. The base pay has been materially raised and the flying pay reduced to a rate similar to that in use on the West Coast and somewhat higher than the prevailing rate in the Mid-West. The new base pay for chief pilots is $3,600 per year, for grade "A" pilots (those with over 1000 hr. and graduates of the instructor's school), $3,000, and for grade "B" pilots it is $2,500. In addition to base pay the chief pilot and grade "A" pilots will be paid flying time at the rate of $3 per hour for single-engined planes and $4 for multi-engined planes. Grade "B" pilots will receive $2 per hour. Double flying time will be paid for night flying.

Actual flying time will not be used in computing the pay, but instead the number of miles to be flown divided by the cruising speed of the plane will be the basis. Major Brainard issued the following statement in explaining the company's stand on the new rates:

Called Advantage to Employees

"From our point of view, these new rates accomplish two improvements over the system which has been in force heretofore. For the first time we are able to grade pilots into two groups. This is fair both to the experienced and to the inexperienced men. There is no logical reason why a man who has flown four to six thousand hours should be considered on the same level with a pilot who has but recently obtained his license. Incidentally the establishment of a lower grade for newer pilots will open up avenues of employment in which younger pilots can accumulate experience and flying time.

"Finally the new rates should tend to raise the standard of living among pilots. With a larger base rate and a lesser flying rate, the pilot is affected less at present by bad weather and slack business than heretofore. The new schedule has become effective only after some six months of study of the question. We are satisfied that it is fair both to us and to the pilots and that it will meet generally with approval because of its tendency to stabilize conditions for professional pilots throughout the United States."

Aero Writers May Band

ST. LOUIS (MO.) — Efforts will be made here during the International Aircraft Exposition, Feb. 15-23, to form an organization of aviation writers similar to other special writers' fraternities. At a recent meeting of St. Louis newspapermen as guests of Cliff Henderson, show manager, plans for such an organization were drafted.

BRIEFLY

William B. Stout has qualified for a National Glider Association first class glider pilot's license, and has been appointed a director of the National Glider Association.

President George F. Zook of Akron University has invited California Institute of Technology to send a representative to confer with university trustees on plans for a building to house the Guggenheim lighter-than-air research laboratory.

Demonstrations of the MacClatchie Panther L-head radial engine will be made on a country-wide tour to be started soon, and transport pilots at the various airports visited will be invited to fly behind the new engine.

Amelia Earhart is said to be planning an attempt early this spring to lower the transcontinental non-stop record, using her new Lockheed-Vega plane with specially fitted extra gasoline tanks. Miss Earhart has just been made a member of the contest committee of National Aeronautic Association.

More than 38,000 visitors attended the National Automobile Show in New York City on the special "Aviation Day," when a program for aircraft manufacturers and pilots was presented.

Henderson Motorcycle Sales Co. Los Angeles, Calif., will soon place on the market a converted engine adapted to serve as a light plane power plant.

J. G. ("Tex") Rankin is credited with having made 19 outside loops in a Great Lakes training plane, over Portland Ore. airport, Jan 7. The plane has an 85 hp. Cirrus engine.

Aircraft and aeronautical products manufactured in Buffalo N. Y. during 1929 had a total value of over $15,000,000, representing an increase of 200 per cent over the 1928 figure, according to a recent report.

Williams Patent Corp., Ltd., has been formed in Los Angeles, Calif., to develop a new type of rigid airship which combines two gas bags with a sesqui-wing airplane structure. It is the invention of Frank D. Williams.

The Ninety-Niners, national organization of women pilots, held a meeting at Newark (N. J.) Metropolitan Airport Dec 31. New England members were flown from Boston as guests of Colonial Air Lines, and returned as guests of Newark Air Service. The next meeting will be held at Long Island Aviation Country Club Feb 8.

On Jan 4, 24 members of New York Women's Aviation Club made an inspection tour of Curtiss Aeroplane & Motor Co's experimental plant at Garden City, L. I., N. Y.

Women's Flying Club of Maryland has been formed in Baltimore with a membership of fifteen.

Consolidated Aircraft Corporation, Buffalo, N. Y., has received orders from the Cuban government for two Husky training planes and spare parts bringing the amount of the total order to $23,000.

Gough Aircraft Corp., Oklahoma City, Okla., has increased its capital stock from $20,000 to $40,000, and is planning early production of an air-cooled engine designed by Frank Gough.

Engineering Foundation, Inc. is the new name adopted by United Engineering Society, a non-profit organization administering real estate, funds and a library for scientific, educational and other purposes.

Chevrolet Aircraft Corp., Indianapolis, Ind., subsidiary of Glenn L. Martin Co., will move its entire factory equipment to Baltimore by Feb 15.

Western Air Express engineers have perfected a carburetor heating device, combined with a new placing of the intake manifold, which is said to improve engine performance. The arrangement is not patented.

Evans Glider Co., Los Angeles, Calif., has completed production of ten primary training gliders and has adopted a production schedule of ten gliders a month, including both primary and secondary types.

Axelson Engine Co., Los Angeles, Calif., is making arrangements for a nation-wide service system.

Metal-Air Corp., Oklahoma City, Okla., plans to erect an $80,000 plant.

Orlando, Fla., will hold an air meet Jan 18-20 in connection with the presence there of planes competing in the Florida Air Tour.

Standard Oil Co. will erect a service station at Port Columbus, Ohio.

Pioneer Instrument Co. has created a new division under the direction of A. P. Homer, to manufacture marine equipment. Various aircraft instruments will be redesigned for motor boat use.

AERONAUTICAL CALENDAR

Jan. 21, 1930	S A E Annual Meeting, Detroit, Mich
Feb. 5-12	New York Aviation Show, auspices Aviators Post American Legion
Feb. 15-23	International Aircraft Exposition, St. Louis, Mo
Feb 20	Meeting of Committee on Airport Management Standards and Ethics, Hotel Jefferson, St. Louis Mo.
Feb. 20-22	Second Annual Aviators Reunion Aviation Post No 651, American Legion Chicago, Illinois
Mar 6-15	Second Annual Pittsburgh Aircraft Show Motor Square Garden, Brown Boulevard Pittsburgh, Pa. Show Director Ray Ritten, Pittsburgh, William Penn Hotel
Mar. 12	Regional Airport Conference for New England, Providence, R. I.
Mar 22-29	Second Annual Aviation Exposition, Buffalo, N. Y.
Mar 26-Apr 1	Cincinnati Ohio Aircraft Show
April 5-13	All American Aircraft Show Detroit
May 3-10	New York Aircraft Salon, auspices Metropolitan New York Division, Distributor Dealers Section, Aeronautical Chamber of Commerce at Madison Square Garden New York City
June 28	Annual R A F Display Hendon, Eng

TRADE TIPS

It has been reported that

A committee has been appointed by Mayor Frank Baltzel, Newark, N. J., to consider leasing the municipal airport to private interests.

Stinson Aircraft Corp., Detroit, Mich., is ordering parts and accessories preparatory to beginning quantity production of a new model.

Board of Public Service of St. Louis, Mo., will receive bids Feb. 4 for construction of two sewer projects at Lambert-St. Louis Field.

Los Angeles Metropolitan Airport, Van Nuys, Calif., is in the market for a glider specially suited for towing behind an airplane.

C. T. Stork Corp., 730 Fifth Ave., New York City, distributors for Great Lakes Aircraft Corp., American Aeronautical Corp., and representative of American Cirrus Engines, Inc., expects to appoint dealers at various airports in the Metropolitan district.

Timken Roller Bearing Co., Canton, Ohio, plans to erect a $15,000 hangar to house its new Ford plane.

City council of Hanford, Calif., plans to ask bids for erecting a four-plane hangar, improving runways and installing a pump at the municipal airport.

Earl Ovington, owner of Casa Loma Field, Santa Barbara, Calif., will contract for the removal of 75,000 cu.ft. of earth in levelling the field.

Joseph Gebhelin, East Baton Rouge Parish, Baton Rouge, La., will receive bids Feb 1 for construction and improvement of an airport, including hangar and administration building.

George Smee, city manager of Ponca City, Okla., is receiving bids on construction of a combined hangar and administration building 125 x 210 ft.

Guggenheim Medal to Wright

NEW YORK (N. Y.)—For "design and construction, with his brother now deceased, of the first successful engine-propeller airplane" Orville Wright has been named first recipient of the first Daniel Guggenheim Medal for Aeronautics, according to a statement by the Fund's Board of Award which is directing a fund set aside in 1927 for grant not oftener than annually of a medal for "notable achievement in the advancement of aeronautics." Wright will receive the medal at Washington, D. C., April 8, 1930 at the time of the celebration of the 50th anniversary of the A.S.M.E. Dr. William F. Durand, of Stanford University and past-president of the A.S.M.E., is president of the Board, which required some time to build in the naming of foreign as well as American members. The body consists of four members named by the A.S.M.E., four by the S.A.E., and one member each from England, France, Germany, Italy, and Japan, representing the foremost aeronautical society of each country.

PERSONNEL

Edward S Evans president of Detroit Aircraft Corporation, has succeeded Harry P Mammen whose resignation was recently announced, as president of Parks Air College, Inc, which is a subsidiary company J A Benoit has been made eastern sales manager for Parks Air College, with offices in New York

Clyde V Cessna, president of Cessna Aircraft Co, will assume the position of general manager formerly held by Maj Howard F Wehrle

Cloyd P Clevenger, formerly partner in the Garland Clevenger School of Aeronautics Tulsa Okla has been made special sales representative of Spartan Aircraft Co in Mexico City

C. P Clevenger

Franklyn Jordan has been appointed aviation editor of the Boston *Evening Transcript*, succeeding Daniel Rochford whose appointment as advertising manager of Pan American Airways was recently announced

Capt. L. G. Devaney, who was the first superintendent of operations for West Coast Air Transport again occupies that position He succeeds Capt W E Lafollette, who has become operations manager for Varney Air Lines at Pasco, Wash.

William S Green, Kansas City, Mo, has been appointed district sales manager for Inland Aviation Co.

Paul Goedert former instructor at Arrow Flying School, Havelock, Neb, has been placed in charge of the recently incorporated Kearney-Arrow Flying Service, Kearney, Neb

George H Palm formerly engineer with Yellow Coach & Manufacturing Co, has been made engineer in charge of radiator construction for Young Radiator Co., Racine, Wis

Walter Storrie has resigned as member of the Wyoming state aeronautics board to become sales manager for Garland Aviation Co, Tulsa, Okla

Frederick P Sansom has been appointed instructor in charge of Colonial Flying Service ground school Hartford Conn He is also operations manager of L & H Aircraft Co., Colonial subsidiary, of Hartford

Ray Wonsey has been made chief pilot for Colonial Air Transport, succeeding Capt Richard W Mackie

George Pulse has been made manager of Grand Dalles airport, The Dalles, Ore., which is now undergoing improvements.

Henry Boynton, former sales manager of the aviation division of Moto Meter Gauge & Equipment Corp, has resigned to accept a similar position with Elgin Watch Co, and will have charge of eastern sales E Grover Insto will fill his position with the Moto Meter company

Bernard Von Hoffman has been elected president of Von Hoffman Aircraft Corp St Louis, Mo succeeding his father, Albert Von Hoffman who remains a member of the board of directors

Charles Smoot, former Texas Air Transport pilot has been named manager of Big Springs, Tex., airport, succeeding Loy A Mitchell

Capt Herbert Marsh has been placed in charge of installation and maintenance of engines for Varney Air Lines, Portland Ore He was formerly with National Parks Airways Salt Lake City

Roy T Minor has been appointed chief test pilot for Angelus Aero Corporation, Los Angeles, Calif

Marvin Devore has been made director of operations for Mid West Aviation Corp at North Platte, Neb

Lieut M D Crawford has been placed in command of the Minneapolis, Minn aviation unit of U S Naval Reserve, replacing Lieut Frank E. Weld, who has been assigned to active duty with the Pacific Fleet at San Diego

John McHugh Stuart has been made publicity director of Fokker Aircraft Corp, with headquarters in New York City Mr Stuart was formerly press representative at Roosevelt Field

Donald Symington president of Baltimore Trust Co, and J G Gosling, of Otis & Co., have been elected directors of Glenn L Martin Co, Baltimore, Md.

Neil Bradley recently sales manager of Universal Aviation Schools at St Paul Minn, has been transferred to a similar position at Memphis, Tenn

Philip Weikert son of Alderman John Weikert has been appointed assistant superintendent of Utica Municipal Airport, Utica, N Y

Joseph P Disbrow Jamaica, L. I, N Y has been elected vice-president and a director of Gates Aircraft Corp

L. E Wilkerson has been made manager of Pierce County Airport Tacoma, Wash

R H Clore has been appointed general sales manager of United States Electric Tool Co Indianapolis Ind L E. Fries has been made Cincinnati district sales manager

C T Schramm, former traffic manager of Universal Aviation School, Minneapolis, Minn., has been made purchasing agent, and Fred Mengelkoch has been made cost accountant Clarence Harmon has been placed in charge of aviation supply sales

Capt Walter Bender, assistant operations manager of Mitchel Field L. I, N Y, has been transferred to Chanute Field Rantoul, Ill

Garza Wooten is now pilot for Southern Air Transport, Inc., at Dallas, Tex

J E. McCullough former instructor at Technical High School, Omaha, Neb, has been appointed chief instructor for the new trade school established by Arrow Aircraft & Motors Corp

New Firms Announced

C T Stork Corp, 730 Fifth Ave, New York N Y., incorporated under Delaware laws, has filed a certificate in the office of the Secretary of State to allow it to do business in New York, capital, 5,000 shares no par value stock, C T Stork, president, to manufacture aircraft, products, and accessories

Alaska-Washington Consolidated Airways, Seattle, Wash, capital stock, $600 000, Alaska-Washington Airways of Puget Sound and Alaska-Washington Airways of Alaska, capital stock, $50 000 each, all three firms by John Ambler, Warren Brown, Jr, and others to furnish airplane service and operate schools

Grand Central Air Terminal, Inc., New York City; capital, 200 shares no par value stock, by Elmer H Holmes, Fred W. Meter, and John Clayton, 60 Wall St to deal in aircraft and operate airports.

Harrisburg Flying Service Inc, Harrisburg, Pa, capital $25 000, by Raymond E. Hartman Richard W Phillips, Benjamin G Helsel, to operate a flying field

Abrams & Boright, Inc, Chatham N Y, capital $100,000, by William Abrams, Charles A Boright, Honora F Abrams, to manufacture steam, electric gasoline, power, and air devices of all kinds

Mountain States Aircraft Co 18 South Center St, Cumberland Md, by A Hammond Amick, Jr, and others

Mississippi Airways Inc Cape Girardeau, Mo, by George Huff and Frank S Moore.

Frostproof Auto Sales, Inc, Frostproof, Fla, capital 100 shares of $100 each, by R H Mizell and others, to handle airplanes and automobiles

Airplane Transit Service Oakland Calif, by A J Angelic, to specialize in the ground transportation and storage of airplanes.

Spillane Aero Supplies Ltd., Los Angeles, Calif capital 7 500 shares no par value stock by J E Spillane, R J. Spillane, and Ray O Boyd

Southern Aviation & Transport Co Memphis, Tenn., by P E. Bruce, f488 Peabody St, and others

Dalhart Aircraft Corp, Dalhart, Tex, capital about $50 000 by J M. Moellendick and associates of Wichita Kansas; to establish a school and taxi service with headquarters at Dalhart

Kearney-Arrow Flying Service Inc, Kearney, Neb; capital stock $25-000, by W W Johnson Guy N Henninger, E. E Bradenberg J B Elliott, C E. Tollefsen, O L Johnson, and Hugh R Brown; to deal in airplanes and accessories, to conduct an air passenger and freight service, and to operate a school

AIRPORTS AND AIRLINES

New York & Rio Gets Brazil Subsidy Contract

NEW YORK (N Y)—Brazil has signed a contract with New York Rio & Buenos Aires Line, Inc by which it agrees to provide the company with a subsidy covering a generous proportion of the operating costs in the development of airlines serving the interior of the country These lines will be in the nature of feeders for the main lines along the coast The company has been granted in Rio de Janeiro what it considers an unusually favorable location for its terminal there The building will be located between the river and the main boulevard in one of the best residential sections of the city

The company recently placed additional orders for equipment with the Consolidated Aircraft Co. It recently acquired six Consolidated Fleetsters and two Lockheeds for use on the line between Buenos Aires and Santiago, Chile These will be fitted with pontoons later and used for experimental night flights on the coastal route The Buenos Aires Santiago service has been operated by way of Mendosa in western Argentina. This airport is used by Pan American and Aeropostale as well, and involves crossing the Andes at an altitude of about 21 000 ft

Investigations by Nyrba pilots have disclosed the existence of a more desirable pass in the mountains south of the present line By using this pass the route between Buenos Aires would be extended about 100 mi but it would involve crossing the range at an altitude of about f6 000 ft Between Buenos Aires and Mendosa the planes have to pass over rather rough terrain which would be eliminated by the new route.

Guggenheim on Roof-Marking

NEW YORK (N Y)—In a final report on its roof-marking campaign the Guggenheim Fund states that under its direction 4,074 communities have installed the proper markings and about 2,000 more are in the process of doing so. About 2,000 others had provided markings before the campaign was opened so that the total of communities marked or being marked, is about 8 000 This campaign was confined principally to communities of between 1 000 and 10 000 population. The Post Office Department, the Aeronautics Branch, Rotary, Kiwanis, Exchange and Lions Clubs American Legion Posts, Elks, Ford Motor Co and oil companies cooperated in the drive Roof-marking is said to be most thorough in the Middle West and on the Pacific Coast, due to installations by oil firms

Glover Proposes Line to Canada

WASHINGTON (D. C)—Establishment of an air mail service between the Twin Cities and Winnipeg has been recommended to Postmaster General Brown by his assistant W Irving Glover as a result of the latter's recent visit to Ottawa to confer with Canadian officials regarding further air mail services across the border This proposed service would be an extension of the present 400 mi Chicago-Twin Cities line and would just about double the length of that airway

T.A.T.-Maddux Cuts Rates Below Railroad

NEW YORK (N Y)—Two drastic reductions in rates have been announced by T A T-Maddux officials The first change effects the 48-hr service between New York and Los Angeles The rate between these cities has been reduced from $267 42 to $159 92 The second rate change reduces from $ 12 to $ 05 a mile the rate between all cities at which T A T-Maddux planes make regular stops on the cross-country hop The new rate is lower than the tariff on the extra fare trains operated by the railroads

When T A T opened on July 8 the rate from Port Columbus to Indianapolis was $30, to St. Louis, $65, Kansas City $104 and Los Angeles, $301 17 These rates were cut 20 per cent Nov 15 Under the $ 05 per mile rate the fare from Columbus to Indianapolis will be $8 80, to St Louis, $20 40, Kansas City, $31.55, and Los Angeles, $125 49,

Along with the announcement of the new cut in fares came the report that rigid paring of personnel would follow Reductions are to be made principally in the traffic department Report that T A T headquarters might be moved from St Louis to Columbus has been denied by officials at Columbus, The new rates were effective Jan 14

U. S. Airports Total 1,561

WASHINGTON (D. C)—The Aeronautics Branch announced Jan 9 that there are now 1,561 airports in this country This is an increase of 41 over the figure of 1,520 announced on Oct 2 [See Aviation for Nov 2] They are distributed as follows Municipal airports 458, commercial fields 49f, Department of Commerce intermediate fields 282, Army fields 68, Naval Air Stations including Marine Corps and Coast Guard fields 14, marked auxiliary fields 246, miscellaneous government fields 2, proposed airports 1,391

Canadian Company Operating to Arctic

FORT McMURRAY (ALTA)—Commercial Airways, Ltd, of Edmonton began operation of its passenger, express and mail service from here to Aklavik in the northern Yukon, Dec 10, and has been carrying out its schedule regularly ever since This 1,800-mi airline extends northward from here across the western end of Lake Athabaska to Fort Fitzgerald. Fort Resolution on Great Slave Lake, Fort Simpson, Fort Norman, and finally to Aklavik on Beaufort Sea on the Arctic Ocean It thus penetrates the heart of the Canadian Northwest and the Yukon country. There is a connection by air between Edmonton the headquarters of the company, and Fort McMurray

Not all the trips are carried through to Aklavik For instance there are only two more through trips in the winter schedule One of these leaves here for the northern terminal Jan 22 and the other March 26 Planes will leave Aklavik for this city Feb 28 and April 1 Planes are flown between here and Fort Simpson and Fort Resolution more frequently Through passenger fare costs $410 and through freight costs $2 70 per pound the rate per pound varying with the distance to the destination

The company is using three Bellancas powered with 300 hp Whirlwinds One machine is kept in reserve at Fort McMurray, while the other two are on regular service Skiis are used in the winter and pontoons will be substituted for summer operations There are other ports of call beside those mentioned above and caches of fuel, each supply being kept at 1 600 gal or more are distributed along the route Among the pilots are Morris Burridge Idras Glyn-Roberts, A McMullen and Capt W R May

Harvard Backs Airport Survey

CAMBRIDGE (MASS)—Paul Mahoney student in Harvard University of City Planning, has started a two months' trip covering airports throughout the country With expenses furnished by the Milton fund, he will make a survey covering ports as far west as Texas and Minnesota for the School and for the Erskine Bureau of Research of Harvard University Last summer he made a similar survey on the West Coast Material which he has gathered and legal data obtained by Frank B Williams of New York will be incorporated in a book prepared by Prof Henry V Hubbard and Dr. Miller McClintock of Harvard

AIRPORT CONSTRUCTION PROJECTS

East

WORK IS TO BE started immediately on the construction of a 20 plane fireproof hangar and a new administration building and passenger station for the Washington (D. C.) Airport, Inc. Award of an $85,000 contract to Bahen & Wright Co. has been made. The hangar will be steel and concrete, 100x120 ft., with 50-ft. concrete aprons at each end. It is to be erected on the eastern edge of the airport with a machine shop and other servicing facilities adjoining. The administration building will be of stucco and brick with offices, waiting room, restaurant and baggage room on the first floor. There will be a glass-inclosed control room and a roofed space for spectators. Completion of both buildings by April is expected.

Buffalo's new mayor has indicated he is in favor of intensive airport development for which an appropriation of more than $1,000,000 is embodied in the five-year budget program pending before the City Council, a large part of which will be used for the creation and development of a marine airport for seaplanes and amphibions at the Georgia Street side on the waterfront recommended by representatives of the aeronautical division of the Department of Commerce. Lieut. Nathaniel E. Duffy, managing director of the Municipal Airport, will be retained by Mayor Roesch.

Bids for the construction of eight steel and concrete hangars with 200-ft. concrete aprons at Floyd Bennett Field, New York City's municipal airport, were opened recently. The lowest bid was that of the Woodcrest Construction Co., Inc., of $1,083,000. The Docks Department, which has charge of the airport construction had estimated $1,051,000. Award of the contract is awaiting study of the proposals.

The 350 acres of land comprising the Rhode Island state airport site at Hillsgrove, R. I., are being cleared. It is expected that the sale price of the land will be considerably more than anticipated.

Bids are being prepared for the construction of about $100,000 worth of buildings at the Hiram Bingham Field at Milford, Conn. This is to be dedicated about May 1.

East Coast Aircraft has installed a 12,000-gal. gasoline tank at the Boston Municipal Airport.

Central

According to the Air Transportation Committee of the Omaha (Neb.) Chamber of Commerce only about $20,000 will be available for further improvements of the Omaha Airport in 1930. During the past year $50,000 available from the $250,000 bond issue was spent on drainage, grading, surfacing, etc. Money for the $25,000 lighting system and other improvements was advanced by private parties and will have to be repaid out of the funds available this year. Because of lack of funds the completion of the runways will not be possible this year nor will funds be available for any further buildings, additional drainage, surfacing or turfing, which is estimated at about $100,000, it is said.

The Aeronautical Development Committee of the Little Rock (Ark.) Chamber of Commerce has recommended that the city enlarge the present government-owned airport rather than attempt to build a new municipal airport on a site not yet determined. A city committee has been investigating a site and has shown preference for one comprising about 600 acres further from the city than the present government field, which comprises about 125 acres and has cost $750,000 to be developed.

The Sioux City (Ia.) city council has awarded contract for erection and installation of an airport beacon light on Prospect hill adjacent to the Rickenbacker Airport, to the Electric Engineer Company on its bid of $835.33. A Sperry revolving beacon, with 24-in. reflector and reserve unit of equal size, will be installed. The Sioux City Gas & Electric Company will supply current for the light without charge.

Machinery and equipment for the first hangar at the new Curtiss-Steinberg Airport, south of East St. Louis, have begun to arrive. The first hangar is to be completed by Feb. 1, when actual flying operations are expected to begin at the new port.

North American Airlines, Inc., of Tulsa, Okla., has been authorized to sell $200,000 worth of its common stock to provide for an expansion program to include airports at Tulsa, Amarillo and Las Vegas.

Robert M. Bahnsen, Rock Island, Ill., has taken lease on the Muscatine (Ia.) municipal emergency landing field and will develop it into a commercial port, after April 1. He will erect a five-plane hangar.

South

Wertz Field, the new municipal airport for Charleston, W. Va., is expected to be ready for operation in June. About two months' work will be required following the advent of Spring. It will be an eight-way field with hangars and shops, a drainage system, automobile roads and grandstand for spectators.

Birmingham will vote Feb. 11 on a proposed $1,000,000 bond issue for a municipal airport. A proposed 300-acre site has been selected with the aid of Aeronautics Branch experts and, provided the issue passes, the land will be purchased by the city and hangars and administration buildings erected thereon.

George Dempster, city manager of Knoxville, Tenn., has let the contract for the grading on Bearden Field, at $8,400. Other improvements will run the cost up to about $40,000.

Jacksonville, Fla., will undertake development of its municipal airport to accommodate seaplanes as well as land planes it was announced recently. A large tract of land adjoining the field will be acquired. The city has $25,000 left of the original appropriation of $100,000.

Work of installing the lighting system at the Titusville (Fla.) field will begin at once. The beacon tower has been finished, and the lighting system is expected to be completed some time in February.

Five items on a building program to cost $1,835,160 at Langley Field, Va., are provided in the War Department appropriation bill. An additional $895,590 is recommended for technical construction, including eight hangars.

Improvements are being planned to the city airport of Beaumont, Tex., to cost about $100,000, including $15,000 steel hangar, a lighting system and drainage system.

Memphis, Tenn., is reported to have awarded the contract for installing a lighting system for its airport at a cost of $16,480.

The Department of Commerce is to establish an emergency landing field at San Marcos, Tex., on the Brownsville-Fort Worth route.

The city of Brady, Tex., has purchased 135 acres on Highway No. 9 for the development of a municipal airport.

West

San Francisco Air & Yacht Terminals, Ltd., 251 Kearny street, has let the contract for plane shelter, mooring platform, entrance buildings and boat shelter, to cost $75,000. It is proposed to spend about $1,000,000 on this development.

The city council of Stockton, Calif., has provided funds for the purchase of additional land at the municipal airport and for the improvement of the hangar facilities.

Delta, Colo., has built an airport and is erecting a hangar.

W.A.E. Reports Radio Traffic

LOS ANGELES (CALIF.) — Figures recently released by Herbert Hoover, Jr., chief of communications for Western Air Express, reveal that his department handled a total of 33,125 messages during December, 1929, over the thirteen radio stations which comprise the Western Air Express dispatching system. This is an increase of 4,897 messages over the total for November and represents a figure of slightly more than 44 messages an hour throughout the entire 31 days of the month, a new high record for the department. The Los Angeles station handled the largest number with a total of 5,960, while Albuquerque was next with 4,120 messages.

Boeing Calls Night Line Success

SEATTLE (WASH.)—More than 250,000 mi. have been flown at night on the passenger and mail route operated by Boeing Air Transport between Oakland, Calif., and Salt Lake City, Utah, without injury to pilot or passenger. The eighteen-passenger transport planes used on this route make the trip in 7½ hr., as compared to 25 hr. required by train.

Showing the new hanger and administration building at English Field, Amarillo, Tex.

Amarillo, Tex., Opens 710-Acre English Field

AMARILLO (TEX.)—Covering 710 acres, English Field has recently been improved by the addition of a $50,000 brick and steel hangar and administration building, and the installation of complete lighting equipment. The hangar, which is 119.6x106x18 ft., is built integrally with the administration building which houses offices, bedrooms, lounging rooms and restaurant. The field, which is covered with virgin sod, provides a runway 1½ mi. long, in the direction of the prevailing wind.

The field is managed by Harold W. English of Amarillo Airport Corp., subsidiary of Aircraft Holdings, Inc., Albuquerque, N. M. It is 8 mi. by paved road from this city. Around the field are 3½ mi. of boundary lights, and there are fourteen floodlights providing a total illumination of 40,000,000 cp. The airport is marked by a 300-ft. white gravel circle inlaid in the sod, and "English Field" in letters 100 ft. high.

Varney Makes Winter Changes

PORTLAND (ORE.)—To cope with special conditions imposed by winter weather, Varney air lines has divided the Portland-Boise leg of its Portland-Salt Lake City mail route into two divisions, returning the division point to Pasco, which is the junction for mail from Portland and Spokane. Three Portland pilots, who have had long experience in flying in the Portland area in all sorts of weather, have been retained to fly the Portland-Pasco division. They are Floyd Keadle, and Al Davis, formerly with West Coast Air Transport, and Bob Gleason. Four main line Varney pilots have been moved to Pasco to fly from there east. They are George Buck, Abe Warner, A. S. Davidson and Lionel Kay.

Standard Also Offers Special Rate

LOS ANGELES (CALIF.)—Standard Airlines, operating between here and El Paso, has joined the ranks of those companies offering tickets costing the equivalent of railroad fare plus Pullman charges to federal, state, county and city officials. Those falling in the last three categories are eligible only if the company's planes cross their respective areas. Others which have offered similar arrangements include Western Air Express, West Coast Air Transport, and Mid Continent Air Express.

Colonial Tries "Flight Escorts"

BOSTON (MASS.)—A system of conducting passengers personally from starting point to destination was inaugurated Jan. 6 by Colonial Airways. A "flight escort" meets passengers at the Hotel Statler here, or at Hotel Pennsylvania in New York, and performs all the duties both of traffic agent and steward during the entire trip.

New Speed Records Reported by Operators

LOS ANGELES (CALIF.)—Two new company records were set recently by Western Air Express planes. The Los Angeles-Salt Lake City record was lowered when a W.A.E. plane piloted by Alexis Klotz and Alan A. Barie made the trip in 3 hr. 45 min. elapsed time for an average air speed of 160 m.p.h. The airline distance between the two cities is 600 mi. The best previous record was 4hr. 5 min. A brisk tail wind made it possible for a W.A.E. plane to lower the Los Angeles-Kansas City record by 24 min. The plane negotiated the 1,420 air miles in the elapsed time of 9 hr. 57 min. for an average of 120 m.p.h. Stops were made at Holbrook, Ariz.; Albuquerque, N. M.; Amarilla, Texas; and Wichita, Kansas. The best previous time was 10 hr. 21 min. Lamar Nelson and Orman Grove were at the controls between Los Angeles and Albuquerque, while Ray Merrick and Hal Hoffman officiated from Albuquerque to Kansas City.

According to recent dispatches received here, new company speed records have been established on the Stout Service freight line between Detroit and Buffalo and on the Universal Chicago-Cleveland line. Lester Bryant, accompanied by James Schultz, left Dearborn at 9 a.m., arriving at Buffalo at 10:25 a.m., an average of 169.3 m.p.h. for the Ford plane. On the Universal line Ray Fortner and Garnett Caldwell, co-pilot, are reported to have flown the 326 mi. in 1 hr. 30 min.

Cape Cod Line to Reopen

PHILADELPHIA (PA.)—Ludington Philadelphia Flying Service, Inc., reports that its Cape Cod Airways, which operated a week-end service between this city, Long Island, Narragansett, Newport and Woods Hole last summer, will be continued next summer. Several planes were operated each way each week end last season.

W.A.E. Lower Rates Cause Traffic Boost

LOS ANGELES (CALIF.)—Following the recent cut in fares by Western Air Express effective Dec. 15, which places fares between Los Angeles and San Francisco on a par with rail rates, 620 persons were transported by air over this route in the two weeks ending Dec. 31. This is said to constitute a new record for Western Air Express over this route, being more than equal to any previous entire month's record for paid passengers between the two cities. During the week preceding the cut total traffic over this route was 38 persons. The first week after the cut brought a traffic of 214, while due to the holiday season and the playing of two important football games, one in the north and the other in the south, there were 406 paid passengers during the last week.

On several occasions, for the first time since this route was opened, second sections were sent out on the regular schedule, and on two occasions three sections were employed to care for the traffic. Western Air Express officials expect delivery of a new 30-passenger four-engine Kokker transport during January and expect to continue the new low rates if public patronage of the larger equipment warrants.

Officials of the line report the tri-engined Fokker F-10 number 101 completed its 200,000th mi. over the Los Angeles-San Francisco route during the last week in December and in almost two years of service the plane has been in the air for a total time equal to 145 full days, has worn out seven engines, and has carried 6,183 passengers.

Move to Buy L. A. Airport

LOS ANGELES (CALIF.)—The Los Angeles City Council has adopted a report recommending that a bond issue of $2,080,000 be submitted to the electorate at the next election, for the purchase of the Los Angeles Municipal Airport site, which is now under lease. The city holds an option on the site covering a period of eight years. Extensive improvements have been placed on the airport within the past year, including two large hangars, an administration and control tower, restaurant building, complete night lighting equipment, and grading and surfacing of a runway system. Miscellaneous activity on Los Angeles Airport now exceeds that at any other Southern California field.

Tests on Visual Beacons Approaching Completion

WASHINGTON (D C)—Development work on the twelve-way visual radio beacons is about completed according to a recent report on results obtained by the Bureau of Standards This has been based on the results with the four-way visual beacon, experiments with which were declared a success in 1928 Tests with the twelve-way system indicate a useful distance range equal to that of the present aural type and exceeding the latter in case of interference This distance range with the present transmitting power is about 200 mi in Winter and 125 mi in Summer

Local interferences between the visual installation on the instrument board and the compass have been eliminated by separating the two about 15 in or by magnetic shielding The new twelve-way installation will cover at the minimum about 1,200 mi of airways whereas the four-way type either visual or aural would cover only about 500 mi The twelve-way type makes it possible to guide planes from almost any direction Since the device is more complicated than the present aural ones an increase in maintenance will be involved Twelve sets are being built for tests under actual service.

Aero Corp. Reports Traffic

LOS ANGELES (CALIF) — Figures for 1929 passenger traffic recently released by the Aero Corporation of California show that the total number of passengers carried during 1929 in its planes was 25 177 as compared with a total of 11 663 in the previous year These figures include both the passengers carried locally and the transport passengers carried by Standard Airlines Inc, a subsidiary Standard Airlines carried 980 passengers during 1928 over a tri-weekly service operated between Los Angeles and Tuscon while in 1929 with the service expanded to include daily service through to El Paso and an air-rail hook up giving through service to the East the passenger total was 3 508 Total mileage flown during 1929 was 422,170

Organize Davis Air Lines

ATLANTA (GA)—Davis Air Lines, Inc., a $200,000 corporation which will operate a daily passenger and express service between this city and Birmingham Ala, is being organized here Douglas Davis will head the firm, which is backed by Charles Adamson Henry L Pritchard, Charles Varn and others Present plans call for inauguration of service with three planes within six weeks

Holmes Airport Name Changed

NEW YORK (N Y)—The name of Holmes Airport at Jackson Heights, Queens, N Y, has been changed to Grand Central Air Terminal.

MacCracken on Port Committee

WASHINGTON (D C)—William P MacCracken Jr former Assistant Secretary of Commerce for Aeronautics and one of America's foremost aviation figures, has joined the Washington Board of Trade to assist in the drive for a model airport here He will become a member of the aviation committee.

Airway Briefs

Airplane passenger service between Seattle Wash, and Mexico City, is to be established as a result of a recent agreement between West Coast Air Transport Western Air Express Standard Air Lines and Corporadione Aeronautica de Transportes

Bills to incorporate Department of Commerce air traffic rules into the law of New York State have been introduced both in the Assembly and in the Senate

Excursion trips by airplane from Los Angeles to Death Valley Calif., are now being conducted every week-end by Curtiss-Wright Flying Service and Furnace Creek Inn Co

According to latest reports about 90 per cent of the topographical survey of the Portland-Pasco airway through Columbia Gorge has been completed and advertisement for bids on lighting equipment is expected soon

Northwest Airways Inc and Canadian American Airlines, both of Minneapolis Minn, are expected to submit bids if the proposed Minneapolis-Winnipeg mail route is approved by the Post Office Department

A fourth edition of "Airplane Landing Fields of the Pacific West" published by Standard Oil Company of California, has just been issued

Application by Washington Air Terminal Corp granting permission to develop a 1 300 acre airport in Hybla Valley near Alexandria Va will be considered by the state corporation commission on Jan. 28.

An appropriation of $50 000 for two years for the development of airports is provided in the budget recently submitted for approval to the General Assembly of Virginia.

Airplanes are featured in an exhibit of models of all types of transportation facilities which is now being shown in the showrooms of Curtiss-Wright Flying Service, New York City

Maj John N Saterfield has been appointed to consult with Parks Commissioner Frank F Cannon of Buffalo N Y on the selection of a new Airport Advisory Board

Supervision of Milwaukee (Wis) County Airport has been transferred from the park commission to the highway committee

Through special wire and radio connections George Rihl, vice-president in charge of operations of Pan American Airways, was able to keep in touch with the company's New York office during nearly all of a recent exploration flight in a Sikorsky amphibion from Para, Brazil, up the Amazon River to the Ford rubber plantation

Establishment of passenger and express service through Little Rock, Ark is being considered by T A T-Maddux officials Mahoney-Ryan Aircraft Corp St Louis, is said to be considering the erection of a branch in Little Rock

The fourth Consolidated Commodore flying boat to be christened the "Cuba" left the company's new assembly plant at Norfolk Va on Jan 8 for delivery to New York Rio & Buenos Aires Line at Miami

Air mail poundage handled through Detroit post office in 1929 was 60 000, as compared with 28 000 in 1928 according to a recent report by Postmaster Chas C Kellogg

Western Canada Airways, Ltd has seven Fokker and three Boeing planes ready for service as soon as the Canadian government sets a date for opening of the Canadian transcontinental air mail service, scheduled to begin some time next month according to reports

Southwest Air Fast Express has made arrangements with Wabash railroad so that passengers may purchase through air-rail tickets from Detroit, Toledo and Chicago to Dallas Tex or intermediate points beyond St Louis on the S A F E line

A new electrically operated wind vane and anemometer has been installed at Lambert-St Louis Field

Boeing System has contracted for 1,500 000 gal. of gasoline and 25 000 gal of oil to be used during the year on its San Francisco-Chicago and Seattle Los Angeles lines

An average traffic increase of 35-50 per cent as a result of the reduction of fares from $ 10 to $ 055 per mile effective Jan 1 is reported by Southwest Air Fast Express

One hour of night or bad weather flying is equal to two hours of fair weather day flying so far as strain on the pilot is concerned according to the results of researches conducted by Dr Edmund H Padden flight surgeon at Oakland Calif airport

Increase in traffic due to the special holiday offer of round trip ticket for the usual one way price led officials of Universal Air Lines to keep the reduction in effect for an extra two weeks' period, Jan 1-15

Temporary night lighting equipment has been installed at Alameda (Calif) Airport and it is now in use for night landings by T A T-Maddux lines

Gustave Lindgren federal meteorologist is engaged in making a state-wide survey of flying conditions in New York, with a special view to determining the most suitable routes for commercial airlines.

Wichita Kan will be one of the next cities to have a federal radio beacon station and airport weather bureau, according to recent reports

FOREIGN ACTIVITIES

Complete Statistics On French Air Traffic

PARIS (FRANCE)—Complete statistics now are available covering French air traffic during 1928

Air-Union on the routes Paris-London, Paris-Marseille Antibes-Bone-Tunis Aggregate length, 1,384 mi., distance flown 831,000 mi passengers carried 11 572 mail carried, 12,720 lb, freight carried, 984 000 lb

Compagnie Generale Aeropostale on the routes France-South America, Toulouse-Casablanca, Toulouse-Bordeaux, Marseille-Perpignan Aggregate length 9,400 mi, distance flown, 1, 840 000 mi, passengers 1 125, mail, 244 200 lb ; freight, 39 380 lb

Compagnie Internationale de Navigation Aerienne on the routes Paris Constantinople and feeder lines aggregate length 2 560 mi distance flown 1, 332 000 mi, passengers 2,378 mail, 23 800 lb ; freight, 968,500 lb

Societe Generale de Transports Aeriens, on the routes Paris-Cologne-Berlin Paris-Brussels-Cologne-Berlin, Paris-Amsterdam, Lyon Geneva Aggregate length, 1,550 mi ; distance flown, 503 000 mi ; passengers 4 623, mail, 6 440 lb ; freight 538 000 lb

The grand total for all French companies is Length of routes operated 14,894 mi ; distance covered, 4 506 000 mi passengers carried, 16 698 mail carried 287 160 lb ; freight carried, 2 529 880 lb

[Reports of European airline operations and finances are announced rather a long time after the close of the period under review The above represents the most complete report covering French airlines for 1928 and is printed as a matter of record, although a year old—Ed.]

European Air Schedules Fixed

BERLIN (GERMANY)—The 1930 international airline time table was the object of a recent conference here between 22 European transport companies Flying time between Berlin and London and between Berlin and Paris is to be lowered 1 hr The summer time table is to apply between May 1 and August 31, the winter time table being in effect the rest of the time Plans were announced for a day service between Oslo and Budapest via Berlin and Vienna and a service between Berlin and Belgrade via Vienna This city is to have overnight mail service with London and Paris on Luft Hansa planes and that company probably will undertake air-rail services between this city and Constantinople and Seville In the former the Vienna night express would be used and in the latter the Berlin-Stuttgart express

Air-Asie Uses New Plane

PARIS (FRANCE) — A new model, Liore et Olivier 199, has been put in service on the lines operated by Compagnie Air-Asie. With weight empty of 4 640 lb and gross weight of 7 500 lb the machine is powered with two 250 hp Hispano-Suiza 6 Mbr engines arranged in tandem under the upper wing The plane has a speed of 124 m p h, with fuel for 5 hr.

Germany Reduces Subsidies to Industry

BERLIN (GERMANY)—Curtailment of subsidies by the federal government and various municipalities threatens serious consequences for the German aircraft industry Present plans call for total subsidies of only $1 500 000 for industrial aircraft development this year and this is to be divided entirely between four companies Junkers Dornier Heinkel and Bavarian Motor Works It is also reported that Luft Hansa will buy only from these four companies in the future. The Federation of the Aircraft Industry intends to lodge a formal protest against this decision by the Ministry of Transport

Operation of Luft Hansa is likely to meet with difficulties if other cities follow the lead of Cassel and Quedlinbourg, which have voted to cease paying the $50 000 annually which Luft Hansa has been receiving from them in return for keeping them on its schedule. Aside from the government subsidy of $2,500,-000, payments of this kind constitute a large part of the company's revenue

French Mail Planes to Meet Boats

PARIS (FRANCE) — Mail between America and Europe totals between 2 200 and 80 000 lb on each liner, according to season The mail is conveyed by rail from Cherbourg to Paris for distribution to various destinations in Europe To speed up this transfer a new air service is to be established soon by the French Post Office in connection with each ship arrival at Cherbourg The American mail bearing the necessary stamping for transport by air will then be conveyed by plane directly to Paris and handed to an airline for forwarding For certain countries, such as Switzerland, which guarantees a given amount of mail considered sufficient to justify a special machine to be used a direct trip will be made without change in Paris For instance the special Swiss mailplane is to fly direct from Cherbourg to Basle, thus further increasing the saving of time Passenger carrying is to be undertaken also.

British Civil Aviation In 1929 Summarized

LONDON (ENGLAND)—Last year was one of steady progress towards the complete linkage of the Empire by air communications At the end of March the first England-India air mail service started The first round trip of 10 000 mi was accomplished in 15 days Extension of the service from Karachi to Delhi was achieved before the close of the year Agreement was reached for the development of a "Through Africa" route and the first section from Cairo to East Africa should be opened before spring and the last section to South Africa by September

An ambitious scheme to develop internal aviation in England made a promising start by the inauguration of National Flying Services Ltd a firm which, with subsidy aid, hopes to establish 22 airports and 100 landing grounds in the country within three years It already has a flourishing headquarters at Hanworth with a large country club and 30 aircraft engaged in training pupils, while provincial airports are being developed. The movement has the support of Sir Alan Cobham, who visited over 100 towns, flew 60 000 mi, and carried 40 000 people many of them municipal officials, in an effort to arouse communities to the necessity of reserving land for airports Much yet remains to be done, for only four British cities have yet fully licensed airports—Blackpool, Manchester Hull, and Nottingham. A fifth airport at Bristol was nearly completed at the end of the year

British air transport has held for some years a record of complete immunity from fatal accident, but it was broken last year by three disasters to liners of Imperial Airways, Ltd New and improved craft were added to Imperial Airways' fleet during the year, and orders placed for four-engined machines carrying 40 passengers

Notable Flights Made

A notable flight was made by Capt C. D Barnard, who accompanied by the Duchess of Bedford in August flew from England to India and back in eight days as a demonstration of fast transport. For this performance he received the Britannia medal of the Royal Aero Club Capt Kingsford Smith after one unfortunate start, succeeded in flying with two companions from Australia to England in 12 days 14 hours, and flying the other way two Australians Moir and Owen bridged the gap between Britain and the Antipodes

A further impetus to civil and sports flying was given by the action of the

(Concluded on page 134)

R.A.F. Report Shows Fewer Flying Accidents

LONDON (ENGLAND)—Flying accidents and fatalities in the Royal Air Force during 1929 showed decreases of 38 per cent and 45 per cent, respectively, from the 1928 figures, despite the fact that there was a considerable increase in the amount of flying done. Improved training methods, increased experience on the part of the technical staff resulting in improved equipment, and the careful study of causes of accidents are given credit for this excellent record The last point is considered particularly important, as the classification of accidents by the Air Staff is unusually careful and detailed Such items as seasonal changes, heat waves, low barometer, drought or flood etc, are carefully examined, in addition to the usual classifications of pilot error maintenance defects, and general weather conditions.

Specifically there were 31 crashes and 42 deaths in 1929 as compared with 50 crashes and 76 deaths in 1928 In 1927 there were 37 crashes and 54 deaths, in 1926 54 crashes and 85 deaths These figures must, of course be interpreted as applying to a steadily increased volume of flying, and the figures for number of accidents per miles flown would probably show an even greater improvement It is also reported that nineteen lives were saved during 1929 by the use of parachutes

New Indian Service Announced

KARACHI (INDIA)—A new air mail service has just been started between Britain and India by which letters can be sent to Jodhpur and Delhi by an air service connecting with the London-Karachi service The use of the Delhi service will ensure the arrival of letters at Delhi on Sunday evenings as compared with Monday mornings by the ordinary route from Karachi and an acceleration of 24 hr will be gained by letters for Bombay, Southern India and Ceylon. The normal fee of $0.10 per half ounce in addition to ordinary postage will be maintained for letters carried by air to Karachi and then on by ordinary route

French Plane Clubs Active

PARIS (FRANCE)—The Aero-Club de France contemplates establishing a touring section with private field clubhouse and flying school, in the immediate neighborhood of Paris At Lille, a new club was created recently, the Club d'Avions Legers des Flandres Another club is proposed by a group of airmen at Dieppe, a seaside resort on the English Channel A landing ground is to be established with the necessary accommodation The Aero Club de Normandie has undertaken the establishment of a suitable field at Rouen, with sheds for the members' machines as well as for tourists

New Civil Air Law For Mexico

MEXICO CITY (MEXICO) — The aviation department of the Ministry of Communications and Public Works has completed its draft of the new civil aviation law which will be laid before the national legislature soon after President-elect Ortiz Rubio takes office next month, it is learned One of the points of the new law will be that companies holding concessions for airways in Mexico will be obliged to employ Mexican pilots as far as possible It is contended that native commercial aviators are finding difficulty in obtaining employment because of the number of foreign aviators serving on the various airways The proposed law, however, undertakes to see to it that Mexican aviators will be fully qualified to hold jobs with the transport lines Rigorous examinations for these pilots are provided for in the projected measure

Fairey Company Reports Profit

LONDON (ENGLAND) — Profits of £164,963 ($801,720) were reported at the annual meeting of shareholders in Fairey Aviation Co, Ltd for the year ending Sept. 30 1929 Since the company was not incorporated until March, the profit for the first five months, $275,192, was set aside as a capital reserve On the other hand, items totalling $155,758, such as preliminary expenditures and debenture discount, were removed from the balance sheet A reserve of $194,200 is created against the item of design assets, so that if necessary the company can at any time afford to write off all designs as obsolete After making these provisions and also providing for payment of $160,380 income tax, the company was able to declare a dividend of seven per cent on its Ordinary Shares

Swiss Air Traffic Reported

BERNE (SWITZERLAND)—Results of Switzerland's international air transport operations during the 1929 flying season (Apr 22-Oct 31) showed an average schedule regularity of 97.4 per cent (97.1 per cent in 1928) A total of 823,298 mi was flown, against 810,433 mi in the preceding year The number of flying hours fell from 9,694 to 9,673, and the average speed increased from 83.7 to 84.9 m.p.h. The number of flights increased from 6,909 to 7,525 15,581 passengers were carried (a 3.6 per cent increase); mail shipments totaled 209,000 lb (increase 14.4 per cent), and freight carried totaled 721,600 lb (increase 11.1 per cent.)

Start Alpine Tourist Service

PASSY-LE FAYET FIELD (SWITZERLAND)—Sightseeing trips over the Alps in the vicinity of Mont Blanc, near here, are being offered by a French pilot M Thoret Winter service was inaugurated Dec 17 with a Potez six-passenger cabin monoplane, powered with 230 hp Salmson engine

English Airport Has Private Radio

LONDON (ENGLAND) — Heston Air Park near here is the first privately-owned airport to be licensed by the General Post Office as a radio telegraphy station. Its radio installation has just been inaugurated by a speech broadcast by Sir W. Sefton Brancker, Director of Civil Aviation. At the same time, a new airplane radio set, especially adaptable to light private machines, was demonstrated. Conversations were carried on between the pilot of an airplane in flight and the ground station. Air Commodore A. D. Warrington Morris also tested the installation in flight.

The transmitting set has a range of 100 mi. It operates on 850-950 m. for aircraft signalling and on 600 m. for shipping. The production of a light radio receiving set will prove a boon to the private owner of aircraft, and it suggests extensive developments which will inevitably ensue. Before long there will be a series of airports in England with suitable transmitting sets, and private flyers and travellers on air taxi services will thus be able to receive frequent advices and weather forecasts.

[Experiments have been made with a plan for coaching solo students through use of the set.—Ed.]

Ground School Opens in Prague

PRAGUE (CZECHOSLOVAKIA) — An aviation ground school said to be the first in this country, has been established as a department of the College of Mechanical and Electro-technical Engineering of the Czech Institute of Technology. According to the Department of Commerce report, only graduates of the colleges of technical and electro-technical engineering and civil engineering, or equivalent training, are eligible to take the course which lasts for a full year and covers a curriculum of sixteen subjects. The tuition fee is $8.80 per semester and attendance for all lectures and laboratory work is obligatory.

British Civil Aviation

(Continued from page 133)

Prince of Wales in purchasing his own light plane and appointing an R.A.F. Reserve Officer as his personal pilot while Lady Bailey completed in January her remarkable air tour of some 18,000 mi. from England to Cape Town and back. There are now 174 privately-owned aircraft in England.

The International Aero Show was held in London in July and proved a complete success. In October the first of the new airships, R. 101, was launched and in the next month withstood gales up to 83 m.p.h., made a cruise over Britain and generally proved herself soundly constructed. The other ship R. 100, left her shed on Dec. 16, and after two flights was housed at Cardington for examination.

Caudron Builds Type 117 Light Monoplane

THE CAUDRON plant has produced an improved version of its well-known C 109 light monoplane the C 117, fitted with a 60 hp Salmson engine and embodying a divided landing gear The main characteristics are Span, 37.7 ft.; length, 21.3 ft.; wing area 206 sq.ft.; weight empty 948 lb; useful load 710 lb; gross weight 1,658 lb; speed at ground level 71 m.p.h., at 3,281 ft 68.6 m.p.h., at 6,562 ft 64.5 m.p.h., climb to 1,640 ft 8 min., to 3,281 ft 17 min, ceiling 9,550 ft

Foreign News Briefs

Competition between two-seater observation and reconnaissance planes is being held by the French Air Force Among those taking part are the new Breguet 27, a Weymann-Lepere, Mureaux, and Potez

Eight possible sites for gliding activities have been selected by Aero-Club d'Auvergne, France, in the vicinity of Clermont-Ferrand Aero-Club de Normandie is also planning to start a gliding school at Rouen

An attempt to surpass the world's duration and distance records for planes with 500 kg and 1,000 kg load is planned by MM Costes and Codos, using the Breguet sesquiplane with which they recently set a new closed course distance record

Establishment of a joint Belgian and French air line to the Congo was recently discussed by the air ministers of the two countries

Two recent experimental flights intended to pave the way to establishment of airmail service from France to Indo China both ended in crashes.

A tour of France by light planes to take place next summer, is being organized under the auspices of the sporting newspaper, *L'Auto*

The Arado VI, Hornet-powered plane recently used for experimental flights from Berlin to Constantinople and to Seville, for Luft Hansa, crashed during a fog on the return trip from the Virgin Islands.

"Ark Royal," first British naval aircraft carrier which was converted from a tanker and commissioned in 1914, is finally being sold out of the fleet She served as the main airplane base for the Allies during the Dardanelles campaign

Establishment of passenger and mail service from Guaymas Sonora, Mexico, across the Gulf of California to Santa Rosalia Lower California, is planned by business men of the former town, as soon as two six-passenger seaplanes are secured. The service may later be extended down the Gulf to La Paz

Mexican army aviators must wear parachutes during all flying hereafter, as a result of an order recently issued by Gen Juan F Azcarate, chief of the department of aeronautics of the Ministry of War and Marine

Mexican commercial transport planes carried 552 passengers and 6,292 lb of mail during November, covering 111,746 mi, according to report by the Ministry of Communications and Public Works

Using a duplicate of the Lockheed low-wing monoplane "Sirius," built for Col Charles A. Lindbergh, Col Roberto Fierro of the Mexican Air Force plans to start March 1 on a good-will tour from Mexico City to Washington, New York, Havana, South America, and over the South Atlantic to Paris and London

An artificial seaplane base measuring 640 x 8,000 ft. is to be constructed at Milan, Italy, and plans for constructing a similar basin at Rome are under consideration

Fare from Brownsville, Tex, to Mexico City over Compania Mexicana de Aviacion line, was reduced from $100 to $87.50, effective Jan. 1

Volume of mail and passengers carried by the Mexican Corporacion Aeronautica de Transportes S A, during December showed increases of 27-30 per cent over the previous month.

Col Pablo L Sidar, chief of the Mexican Army Air Force, has been invited by United Aircraft Corporation of America to undertake a scientific flight over portions of South America A Sikorsky plane will be used, if permission is grantde by Gen Joaquin Amaro, Minister of War and Marine.

A new club to encourage private flying and provide flying instruction at rates far below those in force at present is being formed at present under the chairmanship of M de Sibour in France

A medal is offered by the French government to the author of the best article on aeronautical propaganda published in France between Nov 15 1929, and March 1, 1930

Capt Norman MacMillan has prepared a special guide for air travelers in Europe

About one million dollars have already been spent on the creation of an air base at Singapore, India and it is reported that completion of the project will require a further expenditure of about $1,500,000 The airport will be both military and commercial

Special aerial bombs which will stun fish without killing them bringing them to the surface so that plane pilots may easily locate large schools are being tried out by Norwegian herring fisheries

Assistance of the Soviet government has been promised to George King, American pilot who plans a Moscow-New York flight next fall

Sir John Salmond Heads British Air Force

LONDON (ENGLAND)—On Jan 1, Air Chief Marshal Sir John Salmond K.C.B., D.S.O., succeeded Sir Hugh Trenchard, Bart., G.C.B., D.S.O., as Chief of the Air Staff Sir Hugh Trenchard was made commander of the Royal Flying Corps in 1915, Chief of the Air Staff in 1918 when the Royal Air Force was formed and later in the same year, commander of the Independent Force R.A.F. At the time of the Armistice, plans were under way which would have made him commander of all of the Allied air services In December, 1918, he was again made Chief of the Air Staff, which post he held until the beginning of this year He retires at the age of 56, with the rank of Marshal of the Royal Air Force which corresponds to Field Marshal in the Army, or Admiral of the Fleet in the Navy

The new Chief of the Air Staff, Sir John Salmond, was made commander of the Royal Air Force in France in 1918 when Sir Hugh Trenchard first became Chief of the Staff He has served with the Royal Air Force continuously since that time, and holds a rank corresponding with that of General in the Army, or Admiral in the Navy.

New Fokker Pursuit Built

AMSTERDAM (HOLLAND)—The Fokker D-XVI, a new single-place pursuit plane of biplane construction has been completed here by the Fokker works. The wings are braced with rigid struts and wires and oleo shock absorbing is used in the undercarriage. The wings are of unequal span and are staggered The engine is an Armstrong Siddeley Jaguar series B with supercharger and Townend ring The specifications are: Span 47 ft 4 in., length 24 ft, height 8 ft 10 in; wing area 199 sq ft; weight loaded, with pilot and military equipment 3,058 lb Performance figures have not been announced yet.

WHAT OUR *Readers Say*

Increasing Transport Patrons

To the Editor:

A considerable number of prominent and influential people have patronized and are patronizing air transportation These people can be made very valuable and effective advertising mediums for making passenger air transportation popular with the public

Each patron of passenger air line should be presented with a beautiful button or insignia which can be worn in a conspicuous place and which will signify without any further explanation that the particular wearer is a patron of air transportation

These pins or insignia should be of two or more designs, one design for persons who have taken only one trip by air between any two established air terminals another should be for persons having taken more than one trip and still another could be for persons regularly commuting by air transportation

If a prominent man wears one of these insignia and makes contacts with a great many people in the course of his business he will accomplish a great deal toward making air transportation popular and all of his associates and friends will want to be numbered amongst the air patrons

I believe that if the above idea is carefully developed that it can be made a very effective means of making air travel popular

Harry Braude
141 Milk St., Boston, Mass

* * *

Airplane Hardware

To the Editor:

In Aviation, November 23, 1929 p 1016, Mr John F Hardecker calls attention to the need of standardizing small engine parts and the danger that now exists in the misuse of small hardware, because such may seem to fit.

Concurrent editorial comment stresses the importance of adopting new standards and invites suggestions and comments There came in the same mail some literature from the All-Standard Council of America calling attention to House Joint Resolutions 124 and 125 introduced October 28, 1929 which if made law by Congress will require a general use of metric units after 1935

Centimeter-gram-second units are as is well known used almost exclusively by scientific men, and if we lay aside the question of expense for a moment it seems a pity that airplane engineers should remain out of step with electrical engineers and modern research It does seem incongruous that engine power should be rated in horse power when the horse is rapidly disappearing from the roads of earth But of course Pegasus did have wings and our airmen may have him in mind and if I remember rightly the man who tried to fly to heaven on the back of that horse with wings, got a bad tumble.

A horse power 746 watts, or 550 foot-lbs a second is just what its name implies—a one horse proposition—bearing no simple relation to other units, animate or otherwise If it should come to pass that after 1935 we standardize the yard quart and pound with the meter liter and gram, our airplane mechanics will at once make a mental "fix" of the ratios Familiarity with our decimal coinage, makes it easy to correlate millimeter with mil, centimeter with cent, decimeter with the dime and meter with good old friend dollar.

In the Manufacturers Specifications in American Commercial Airplanes compiled by Aviation, there is quite a range in spans from 26 feet to 100 feet Most of these are in feet, inches and in some cases half inches, thus, 29′ 8½″, and 52′ 8½″, and in length 21′ 10½″

Now the wing loading is given in lbs per square foot but in a decimal form thus 27 13, and we wonder why the quite common practice of giving inches and fractions as decimals of a foot was not used! Thus instead of 29′ 8½″ it would have been easier to write 29 70 feet. But this is very close to 9 meters and many of the dimensions given suggest that there has been a translation from dimensions originally those of French, German or Italian planes

The whole problem would seem to call for careful consideration at this time and it might be easier than we think to get in step with foreign manufacturers

Director Alexander McAdie
Blue Hill Meteorological Observatory,
Harvard University

[With Professor McAdie's friendliness to the metric system some of the members of this editorial staff are in warm personal agreement. With his suggestion that English units should be given in decimal form rather than in feet and inches we find it easy to concur on strictly logical grounds but we must give our readers information in the form which will be most directly useful to them. We may wish Professor McAdie good luck in his campaign, and even actively support it but we feel the obligation to continue to give statistical information in our own columns in the terms which our readers as a whole at present employ in their own shops and engineering activities —Ed]

Editorial Comment FROM THE DAILY PRESS

A New Mail Airport

Prospects that a new airport over the New York Central tracks will supplement the new postoffice which the government promises soon to build for Rochester, are in line with a general tendency throughout the country to build airports nearer to the heart of big cities

Many cities both in this country and abroad have discovered their mistakes in locating their airports too far from the center of activities In the early days of aviation the one thought was to acquire a site large enough to accommodate the planes without endangering nearby property Such sites naturally, were on the outskirts of cities

With the airplane already a vital part of the nation's business life, the importance of having the airports accessible to people who have the most use for them becomes more apparent Especially in the operation of the air mail is this true Part of the time lost in transporting mail from city to city by air is lost by the time required to transport it from the airport to the postoffice or back again The great advantage of the airplane is its speed obviously much of that advantage is lost if it takes too long for one to reach the airplane

More than a year ago an engineer in New York City after a survey recommended that cities begin to give thought to the necessity of having two or more airports, one as near as possible to the heart of the city, for passenger and mail traffic, and the other beyond the outskirts, for large commercial planes, where the buzz of their motors would not disturb residents

Sites large enough for landing fields in the heart of large cities are not available, the only solution is to manufacture them as it is proposed to manufacture one for Rochester over railroad tracks or yards where room is abundant and where the safety factor met satisfactorily.

Rochester (N Y)
Democrat & Chronicle

* * *

Aviation Seeks a Showdown

Is America air-minded?

Does it really believe in aviation as a normal commercial enterprise or has its enthusiasm been simply a hangover from the Lindbergh party?

Transcontinental aviation lines have had difficulty in attracting business. They cover the country in two days instead of the usual five but the traveling public seems to prefer five days on earth to two up above

The plea of costliness has been raised

Now comes the showdown!

One large aviation concern is issuing mileage books at straight railroad rates to business men. It will cost no more to travel by air than by rail and Pullman

It remains for American business avid for speed to show whether it has confidence in aviation as it has recently developed

If advantage is taken of the new rates, which cut the old fares in half, then American interest in aviation is a normal growth, promising rapid development

If the low fares do not substantially increase air traffic the experimenters say it will show that the American public still needs a lot of education to become really air-minded

—Philadelphia, Pa., Record

* * *

Dispel the Mystery

The month just drawing to a close has been anything but kind to the cause of aviation For that matter it has been anything but kind to transportation in general what with Western blizzards and Atlantic gales and fogs that were more treacherous than either. But the record of accidents in the air, by no means all of them due to the weather, has been singularly disquieting Obviously man-made wings are still something of an experiment

It is unnecessary to list the number of crashes that have been echoing in the headlines. Those of the various long-distance flyers—in Brazil, in northern Africa, in Indo-China—will readily come to mind but one's imagination is inured to this sort of accident The chances inseparable from the hazardous, pathfinding flight cause us to discount disaster in advance and to dissociate it from routine aviation The real shock to confidence comes from such a tragedy as that which befell Representative William K. Kaynor of Springfield Mass and his four companions when they took off a week ago from Bolling Field on what was to be a brief hop to his home town

Here was a three-motored Army plane of standard make in excellent condition, piloted by one of the Air Corps' ablest and most experienced flyers The load was normal, the weather propitious Yet it had no sooner climbed into the air, a matter of 400 feet than it side-slipped fell into a tail spin and crashed, killing every one aboard What happened? The question so far as the public is concerned, remains unanswered and while it does few contemplating an air journey can feel quite as secure as they did before the ghastly thing occurred

The Army and the Department of Commerce owe it to the country to clear up this mystery if they can as soon as possible There are intimations that the pilot was at fault through overconfidence, in which case one can understand the reluctance of the authorities to issue a report reflecting on a popular flyer who paid for a second's poor judgment with his life But there is too much at stake to permit such a consideration to seal their lips To keep the public in the dark concerning the causes of this and similar accidents is to play upon its fear of the air and indefinitely to retard the progress of commercial aviation

As a matter of fact the proportion of flights that come to grief to the number made is extremely small, even in an unlucky period like the present but the element of mystery that so often surrounds the air crash gives it an importance to the human imagination that destroys one's perspective Wherever possible this mystery should be dispelled as completely and promptly as the circumstances allow

—New York Herald-Tribune.

New Volumes FOR THE SHELVES

American Aviation in 1929

1929 United States Aviation Reports, *by Arnold W Knauth, New York, Allen J Furlow Washington D C, Henry G Hotchkiss New York and Emory H Niles Baltimore United States Aviation Reports, Inc, 1929 pp X 961*

The 1928 United States Aviation Reports collected the cases on aerial law decided in the United States between the years 1922 and 1928, together with the state and federal statutes and regulations To the extent that statutes and regulations were included, the Aviation Reports were unlike the ordinary state federal and sectional reporter systems, which are confined strictly to a reporting of cases decided This variation from the usual content of reports was not only wise, but necessary The Editors of Aviation Reports recognized that there are many factors other than legal decisions which influence the development of the law and have from the beginning included statutes regulations and even reports of semi-official bodies

The policy adopted in the first volume has been continued and expanded in the 1929 United States Aviation Reports just completed and now available for distribution The volume covers 961 pages and comprehensively includes decisions relating directly and indirectly to the law of aviation, federal, state and territorial statutes, Canadian statutes, federal and foreign regulations, and other miscellaneous documents, such as the Patent Cross-License Agreement 1928 Uniform Ordinance and Field Rules for Airports and the Report of the American Bar Association Committee 1929

Only twenty-two new decisions are reported These deal with a great variety of problems One may be allotted to each of the following fields of law common carriers, crimes, contracts constitutional law, practice and pleading, and workmen's compensation four may be classified as in the area of torts five may be allotted to insurance, and seven to municipal corporations There is in this an indication that the principal problems of aviation law are revolving around the determination of the tort liability of the air transport carrier, the proper construction of insurance policies carrying exceptions from liability in case of death while "engaging in aeronautic operations," and of the rights and liabilities of municipalities owning and conducting airports.

An examination of the 1929 Aviation Reports reveals that 88 pages are devoted to federal statutes, 504 pages to statutes enacted by our state and territorial legislatures and 6 pages to Canadian statutes The disproportion in space required in setting out statutes as contrasted with that devoted to decisions indicates the large measure in which resort is had to legislation to solve the legal problems involved in aviation This makes clear the necessity of maintaining a watchful eye upon pending legislation in order that the hazard of hasty and ill-advised legislation may be minimized

Not the least valuable part of the

Reports is found in the section on Commercial Aviation Forms Among the forms included are an Airport Lease, Airport Lease and Management Contract, Passenger Agency Contract —Private Carrier, Students Contract, Flying School Contract, and an Airplane Purchase Chattel Mortgage In all fifty pages are devoted to these forms, which will prove useful, not only to the practicing lawyer concerned with areonautical law, but also to aeronautical executive groups

Perhaps the most interesting part of the 1929 Aviation Reports is the section dealing with miscellaneous documents, the most important of which is the Report of the American Bar Association Committee, 1929 The members of this Committee were Chester W Cuthell, Chairman, W Jefferson Davis, Randolf Barton Jr, John A Elden and B M Holden The report is significant chiefly for two reasons 1 Because it recommended that the Committee on Aeronautical Law, in its own name, and not in the name of the American Bar Association, should be authorized to present the draft of the Uniform Licensing Act, previously approved by the Committee, to the various state legislatures, 2 Because it recommended that the Association should sponsor the drafting of a Uniform State Aeronautical Code

The Aviation Reports contains an exhaustive Index-Digest which makes the material contained therein readily available, it is printed in clear legible type, the format is good and the book presents an attractive appearance All in all, the 1929 United States Aviation Reports constitutes a highly useful and constructive piece of work, an indispensable aid to any one interested in the development of aviation on either the industrial or legal side.—Alison Reppy, *Editor of the Air Law Review, Affiliated With New York University School of Law.*

Abstracts AND *Reviews*

Art of Flying

The Art of Flying Landplanes and Seaplanes—*By Capt Norman MacMillan, M C, A F C*

Captain MacMillan presented this short paper before the Royal Aeronautical Society to show some of the more salient points on which the "art" of flight is dependent. He showed that the time of development of this "art" could be materially shortened by an adoption of a mental-cum-practical method of flight instruction and strongly recommended that it be universally used. Flying is divided into two distinct parts ground flight, under which may be included the takeoff, the approach and the landing, and fully airborn flight, and it is especially during the early stages of this ground flight that any knowledge obtainable from the flier "artist" is of greatest value, for oftentimes, to be forewarned, is to be forearmed.

Before the takeoff, wind direction, nearby obstructions, and other flights, instrument readings and controls should be rigidly checked and considered The takeoff is more or less a function of the airplane itself.

With the sufficient direct drive, high speed propeller, the only thing that can be done is to tease the plane along until the point of marked increase in acceleration denoting the passing of the critical velocity is noticed, best takeoff is obtained by forcing the tail up until the fuselage reaches the angle of minimum resistance

High loadings require great skill in the takeoff, the angle of best lift/drag ratio limiting the total oscillation sometimes to two degrees on either side of the optimum A thin wing with its resultant critical angle of stall must also be allowed to fly itself off, whereas a thick section can be given a decided positive angle with considerable decrease in the length of run due to lesser wheel loading.

On soft ground the tail must be kept low to reduce the nosing over moment, with increasing speed, the tail must be allowed to rise, in order to reduce head resistance and to enable the pilot to assume effective elevator control over the uncertainties of the runway

The seaplane takeoff differs from that of the landplane in that it requires considerable skill to get across the hump if the power is low Once the hydroplaning commences, acceleration is rapid and the water resistance falls immediately, but towards the end of the run it builds up again, and it is essential that a critical angle be held where the resistance of the float is a minimum.

Whenever feasible, the pilot should sit centrally in the fuselage and should look straight ahead. Any other attitude tends to give a curved course

The approach for landing should be studied by careful observation of the methods of birds and of experienced fliers. Generally speaking it is better to overshoot the field, since it is easy to reduce altitude with a sideslip, whereas undershooting necessitates the use of the engine and a change of attitude of the plane The actual alighting is best accomplished by looking well ahead of the plane It is a relatively simple operation if the approach has been made successfully.

In rough weather, the seaplane must be brought down on a surface which would appall the average landplane pilot The plane must land as slowly as possible, and directly on the crest of a wave.

Under normal fully airborn flight, the pilot should learn to be independent of the ground, although it is logical that the horizon should act as a datum line during his early training period. He should know how to cause and how to recover from all varieties of spins,

• • •

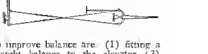
Flight Test Data

Information Obtained from Airplane Flight Tests in the Year 1927-1928. *By W Hübner From Zeitschrift für Flugtechnik und Motorluftschiffahrt April 29 1929 N A C A Technical Memorandum No 535*

This translation covers the effect of the structural features of an airplane on its balance, stability, controllability, maneuverability, and spinning characteristics These five flight tests were conducted by the Deutsche Versuchsanstalt für Luftfahrt and the German aircraft manufacturer for the purpose of determining the best design features for future planes

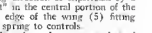
It was found that the balance of a plane should be only slightly effected by slipstream. The methods suggested

Use of tension spring filled to controls



to improve balance are (1) fitting a weight balance to the elevator (2) bending the portion of the elevator farthest from the axis of rotation either up to produce tail-heaviness, or down to produce nose-heaviness (3) warping the elevator surface (4) changing direction of slipstream by a "cut-out" in the central portion of the trailing edge of the wing (5) fitting tension spring to controls.

Stability about three axes is desired when flying "hands-off" Shifting the C G forward, increasing the size of



Comparison of normal elevator with type used in method 2

the horizontal control surfaces, and having rectangular sections improves lateral stability Stability about the vertical axis can be achieved by increasing the area or the position of the fin. Dihedral is the only known method of improving stability about the longitudinal axis

The use of free compensating surfaces for controllability is to be avoided generally when decreasing control forces, due to structural difficulties and effects on balance. "Internal Balances" may be used for

elevators, rudders, and ailerons, in which case the hinge positions are changed. Rudders should be of sufficient size, having a chord not less than 20 per cent of the wing chord with a shorter trailing edge than leading edge. Maximum efficiency is achieved with ailerons extending to the wing tips over not more than ⅓ the span, and whose chord is approximately 20 per cent of the wing chord The ratio of the stabilizer chord to the elevator chord usually is 1.5

Controllability and reserve power are functions of maneuverability which varies with the type of plane required. Looping and spinning should be possible for all planes However, the "controlled spin" is considered the most important maneuver when testing flight characteristics In this way the degree of control efficiency and flying ability may be determined

Since there is no definite method known to prevent spinning, every plane should have characteristics which enable a recovery from a spin. The shape of wings and airfoil sections aids in determining the amount of autorotation or spin Large positive staggers and forward position of the C G gave desirable characteristics Coupled with these design factors are effective controls and control surface efficiencies.

These flight tests were continued in 1928-1929 by the D V L in view of developing methods and instruments for the numerical determination of airplane characteristics

• • •

French Aviation

Recent Progress of Aeronautical Science in France, *By Mons P Franck The Journal R A S, No 226 Vol XXXIII, October, 1929.*

The main objectives of French aeronautical progress have been safety, the development of commercial aviation and metal construction

The precautions used to guard against fire are similar to those used in the United States In addition a device is now in use to warn the pilot by special alarm.

A design load factor of five is at present generally required Safety of the multi-engined airplane is to be increased by the development of a free wheel device on the propeller to reduce the drag in the event of engine failure. Having the engines turn in opposite directions is a partial solution to the problem of steerability with one unit stopped Experiments are being carried on to determine the effect of a change in the axis of the engine with respect to that of the airplane For landing a device has been perfected to release the brakes if the tailplane rises, to prevent nosing over The automatic stabilizer is under development here as in other countries

Decrease in engine weight has been obtained by increasing the speed and using reduction gears, The weight-power ratio of a water cooled Hispano 600 hp engine has been reduced to 1.74 lb per b.hp Durability is being increased by the use of cylinders treated by the nitruris process.

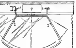
French experiments have shown that the leader cable is the most accurate method of guiding the pilot exactly to the aerodrome A 500 watt short wave radio transmitter, using the same aerial while flying as while stopped, has been heard at a distance of 2 500 mi. Compasses have been improved by the adoption of a vertical scale. For the Navy an instrument has been designed to calculate reckonings which gives angles accurate to less than 5 min. and is simple to use

New Patents

Windshield Heater

1,741 999 WINDSHIELD HEATER. George Henry Heckmann Saddle River, N J Filed June 3 1929 Serial No 333,438 1 Claim. (Cl. 219-19.)

A heating element in the form of a frame is pivoted on a bracket above the windshield so that it may be swung down against the glass in front of the operator or swung up when not in use This frame is formed of an



The illustration shows frame 1, heating wire 2, pivots 3 4 the pivot 4 including the automatic switch

electric heating wire encased in a ceramic covering A shield is provided for directing the heat against the windshield One of the brackets is designed to include a switch so that when the shield is swung against the windshield the circuit is automatically closed The generated heat is intended to prevent formation of ice on the windshield.

• • •

Bomb-Dropping Device

1,741 195 AUTOMATIC BOMB DROPPING DEVICE. Antonio Lombardo, Brooklyn, N Y Filed Feb 10 1928 Serial No 253,294 2 Claims (Cl 244—1)

Vertical chambers are provided at each side of a box fixed to the underside of an airplane Bombs are arranged one above the other within the chambers Each bomb is held in position by a pair of fingers extending into the chamber from which they may be withdrawn to release the bomb For withdrawing the fingers there are provided cables extending to the cockpit The fingers are designed to be folded up by springs when withdrawn so that they will not interfere with the dropping of the next bomb. When the device is not in use sliding doors are provided for closing the openings in the bottom of the chambers,

• • •

Airplane Landing Gear

1,741 994 AEROPLANE LANDING-GEAR ARM Simon S Vargas New York N Y Filed Apr 3 1929 Serial No 352,273 8 Claims. (Cl. 244—2)

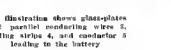
The landing gear of an airplane consisting of the usual wheels is attached to the fuselage in such manner that upon landing there is designed to develop a rearward turning moment which, it is stated, will assist in preventing nosing over. For this purpose the bracket is formed to position the wheels further than usual toward the front of the craft. In a modified form the wheels are slidable from front to rear so that the pilot may adjust the degree of rearward moment

• • •

Windshield Heating Means

1,741 582, WINDSHIELD AND THE LIKE Joseph Augustin Fagut Montreal Quebec Canada Filed Jan 18, 1929 Serial No 247 787 1 Claim. (Cl. 219—19)

The windshield consists of two similar glass plates, one in front of the other, fastened together at their edges by copper binding strips Parallel electric conducting wires are enclosed between the plates and connected to the copper strips which act as lead-in conductors for current supplied from a battery and controlled by a switch The current is intended to heat the wires to prevent formation of ice on the windshield



The illustration shows glass-plates 1 2 parallel conducting wires 3, binding strips 4, and conductor 5 leading to the battery

THE BUYER'S LOG BOOK

AC Mica Spark Plug

IN ADDITION to the present line of AC plugs a complete line of mica insulated spark plugs especially designed for aircraft engines is now offered by the AC Spark Plug Company, Flint, Mich. These plugs have been graded according to heat range, making it possible to provide the correct plug for extreme operating conditions.

Mica insulated plug

The plug is made gas tight by an electrical process and the side wire is electrically welded, permitting 35 times greater electrical and three times greater heat conductivity, according to the manufacturer. Terminal connection and center wire are fused together electrically, eliminating danger of the connection becoming loose from vibration. Long insulation is provided between terminal and steel shell preventing spark "flashover" at high altitudes. The plugs are demountable with metal parts cadmium plated to prevent rusting.

Ball Bearing Live Center

THE ball bearing equipped tailstock live center lately placed on the market by the Ready Tool Company of Bridgeport, Connecticut is designed to meet the greatly increased speeds at which metal removing machines now operate. By furnishing a rigid and non-deflecting support for the work this design aims to reduce chatter and obtain cleaner cutting. The angular contact bearing has solid, high carbon chrome steel inner and outer races and is so assembled that the two rows of balls are opposed in a definitely preloaded condition.

When the center is set up, the work is brought close to the tailstock proper so that the inherent rigidity of the bearing is not offset by defection of other parts which would result where there is considerable overhang. Another feature in the design is the housing closure or seal located on the side opposite the work and protected from the direct force of the cutting compound. The rotating housing helps to keep the lubricant in, but throws compound and chips away from the bearing seal. The ball bearing is so mounted in the center that the outer race rotates with the nose of the center and the nose, or point, is ground after assembly. Since the center nose rotates with the work, regrinding of the nose is infrequently required but may be accomplished without removing the center from the machine. The bearing is now manufactured in the most frequently required taper sizes but tapers of any type or size can be made to order.

Cable Splicing Device

A NEW Universal Cable Splicing Device has been placed in production by the National Steel Products Company, Dayton, Ohio, a subsidiary of Aero Supply Manufacturing Company. This tool provides for holding the

Universal cable splicer

thimble and cable in position while the splice is being made by the universal action of the jaws which tightens the cable around the thimble. It is adjustable for any size thimble and when placed in a vice can be revolved allowing an even pull on each strand during the splicing operation.

Silent Chain Bench Lathe

A NEW silent chain motor drive adapted to a complete line of bench lathes has just been announced by the South Bend Lathe Works, South Bend, Indiana. The drive is available on both the 9 in. regular and 9 in. junior models. An interesting feature is that the motor, the enclosed and automatically lubricated chain drive, and the jackshaft cone pulley are mounted over the lathe headstock, out of the way of the operator, chips and dirt, on a substantially made bracket and tilting table which allows easy belt shifting. The adjustment for the belt stretch is independent of the tilting table.

The new model 9 in. bench lathes are back geared screw cutting universal precision tools used for piston finishing, connecting rod reboring, armature, shaft and commutator truing, bushing making, thread cutting and a large per cent of other automotive replacement and repair machine work.

TRADE CATALOGS

AIR COMPRESSORS. The "Brunner Air Compressor Manual" is the title of a 48 page booklet recently published by the Brunner Manufacturing Company for the use of aircraft mechanics and operators. A catalog of the improved Brunner line is included.

SIKORSKY S 38. A recent 16 page catalog published by the Sikorsky Aviation Corporation describes the important features of the S-38 with special attention to the interior. Specifications and performance figures are given. Illustrations of the plane over land and on water are included together with views of the plant.

TUNGSTEN CARBIDE. The Porter-Cable Machine Company is now publishing a combination informative booklet and catalogue entitled "Turning With Tungsten Carbide." The first part of the booklet is devoted to information on the Tungsten Carbide, while the latter section is the catalogue on their new Carbo-Lathe.

LE BLOND 90". A folder furnishing specifications of the Le Blond "90" has just been issued by the Le Blond Aircraft Engine Corporation. Illustrations of the engine parts and of airplanes with Le Blond installations are shown in the folder.

Gunn Steel Propeller

THE NEW Gunn steel propeller designed for 90 hp. engines is now being manufactured and distributed by the Aircraft Specialties Company, San Mateo, Calif. The blades, which are interchangeable, measure 4 ft. $\frac{3}{4}$ in. in length, $6\frac{1}{2}$ in. at the greatest width and $\frac{1}{8}$ in. in thickness being countersunk to receive the filet of each bolt. The leading edge of the blade is practically straight with an offset of $\frac{3}{16}$ in., while the trailing edge is beveled and tapers from the greatest width toward the tip of the blade and toward the hub.

The hub is manufactured cast steel, annealed and heat treated. The hub arm which holds the adjustable blades is 12 in. long $3\frac{1}{4}$ in. wide and $\frac{3}{4}$ in. thick. The portion of the hub holding the braces in position is 9 in. long, $3\frac{1}{2}$ in. wide and $\frac{3}{4}$ in. thick. Braces are of chrome vanadium steel heat treated and oval design streamline, $\frac{1}{4}$ in. thick and $\frac{3}{4}$ in. wide. They are fastened to the hub and blades by nickel steel bolts $\frac{1}{2}$ in. x 1 in. held in position by castellated nuts and cotter keys of S.A.E. rating. The total weight of the propeller including spinner is 55 lb.

Air for Airplanes

Before you purchase that air compressor for operating spray gun—for cleaning engines and planes—for tire inflation—for general shop work—be sure to consider carefully every feature of Quincy Compressors.

Here is a compressor line of 14 sizes, air cooled and water cooled, from which to select the exactly right compressor for your needs.

Quincy Compressors

are designed and built to deliver air at the lowest possible cost for power and maintenance.

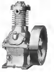
They are rugged and long lived, and so quiet in operation that one is hardly aware of their presence.

Quincy Compressors are not "cheap", they're "good."

Send the coupon for full details.

Model F-2

Air cooled and designed especially for service where a large volume of air is required as for paint spray work on glue [illegible] and similar work. Supplied also in portable form. 150 lbs. cut off pressure. Displacement 6 cu. ft. with 1 H.P. motor, 8 cu. ft. with 1½ H.P. motor



Model A

An air cooled compressor made in 8 sizes with displacements ranging from 1 to 27 cu. ft. per minute and requiring motors of from ¼ H.P. to 5 H.P. "V" type drive furnished as regular equipment, when desired

Quincy Compressor Co.,
208 Maine St., Quincy, Ill.
Please send details about Quincy Compressors

Name

Address

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QUINCY COMPRESSOR CO.

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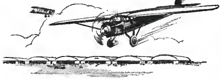

Speeding up airplane production and servicing

with Curtis compressed air equipment

FULLY as important as the speed of planes is the speeding up of the building maintenance and servicing of planes. Executives throughout the aviation industry are rapidly coming to realize that compressed air is one of the most important factors in putting speed into this work.

Obviously, time, labor and money are saved in very appreciable amounts by compressed air equipment such as—

CURTIS TIMKEN EQUIPPED COMPRESSORS—providing air for spray painting, spraying dope on the wings, tire inflation, charging shock absorbers, spray cleaning engines, spraying of grease solvent or paint removers, air-drying of parts dipped in cleaning solutions, blowing out dust, chips, etc., at work benches and drilling presses; air power for operating air hoists, riveters, pneumatic drills, sand blasts, pneumatic water systems, etc.

CURTIS AIR HOISTS—Power hoists at little more than the cost of chain blocks. Used with a Curtis I-Beam Trolley or Crane, they can serve a wide floor area. Used for lifting engines out of fuselages, mounting engines, and other parts, and many other purposes where a combination of power, speed and accuracy is a factor of economy. Because there are no delicate mechanisms, even unskilled laborers can operate Curtis Hoists without danger of throwing them out of commission.

CURTIS AIR TANKS—Portable tanks for taking air out to a plane away from the usual source of supply. Stationary tanks for use with compressor unit in the shop, also separate tanks for mounting on service trucks.

Curtis I-Beam Cranes and Trolleys 10 to 40 ft. span and ½ to 10 ton capacities.

Curtis Compressors are ½ to 50 H. P. with capacities up to 250 cu. ft. per minute.

Curtis Air Hoists, capacities from ½ ton to 10 tons.

Curtis Portable Air Tank—For taking air out to a plane away from the usual source of supply.

Write for new Catalog C-75

CURTIS St. Louis

The Curtis Pneumatic Machinery Co., was founded in 1854 and is therefore in its 75th year. Three quarters of a century successful business existence can be explained only by integrity, sound policy and financial strength to permit the extensive development and research work necessary to keep our products in advance of competition.

1954 Kienlen Ave., St. Louis
5518 AF Hudson Term., N. Y.

Check products in which interested. Write name and address in margin and mail.

A2

Contact

at the INTERNATIONAL AIRCRAFT EXPOSITION

St. Louis

February 15-23

(INCLUSIVE)

AVIATION is not only the oldest publication in the field but it is the outstanding publication in point of service to the industry. It is edited by Edward P. Warner, former Assistant Secretary of the Navy for Aeronautics and professor of aeronautical engineering at Massachusetts Institute of Technology. His appointment as Editor of *Aviation* was acclaimed by the industry as a great step forward in industrial journalism.

Average net paid A.B.C. in excess of 20,000 copies.

Total circulation February 15 issue, 24,200 copies.

THE aviation industry is all set to enter into a new merchandising era. Executives throughout the industry have tuned up their sales promotion plans to make use of all types of sales producing tools.

The majority of them will "give the gun" to their spring selling drive by exhibiting at the outstanding show of 1930—The International Aircraft Exposition, St. Louis, February 15 to 23. It will be *there* that

AIRCRAFT MANUFACTURERS will sell to distributors, operating companies, short hop operators, pilots, schools and sportsmen flyers.

DISTRIBUTORS will sign up for new models of aircraft and appoint new dealers.

DEALERS will determine the makes of aircraft and accessories which they can sell to best advantage.

MAKERS OF PARTS, ACCESSORIES and MATERIALS will introduce new products to aircraft manufacturers and replacement houses.

AIRPORT EQUIPMENT MAKERS will meet visiting port officials and close contracts for new installations.

PILOTS will decide on new and better planes and equipment.

FIXED BASE OPERATORS will examine planes at the show and in the air and decide on equipment for next season.

FLYING SCHOOLS will inspect new models of planes built primarily for training purposes.

At the same time manufacturers of all types of aeronautical products will advertise their products in the St. Louis Show Number of *Aviation* out February 15. They know they cannot depend fully upon individual contact, as it will be impossible for their salesmen to meet and talk to all who are interested in their products. . . .

. . . a typical example of coordinated sales effort that is bound to bring the best results.

Forms Close February 6

AVIATION

A McGraw-Hill Publication

Tenth Ave., at 36th St. New York, N. Y.

Zapon products give assurance in the air.....

In every sort of weather, in every land, in thousands of miles of hard flying service, Zapon tested products consistently prove their worth. In aviation there is no compromise for safety—endurance—dependability.

Zapon's intensive system of testing and inspection of both chemical and physical properties insure the highest quality standard in:

Clear Nitrate Aeroplane Dopes
Semi Pigmented Aeroplane Dopes
Gloss Pigmented Aeroplane Dopes

Also Thinners, Lacquer Enamels and Lacquer Primers

The artistic beauty of Zapon Cloth, achieved through striking patterns and brilliant colors has placed it first among fine cabin upholstering material. A standard for 30 years this waterproof material works evenly and smoothly.

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Where Van Schaack Dope Meets the Test of Efficiency

Dope Room—Alexander Eaglerock Production

NOW is the time to increase the efficiency of your production schedules—for in the aeronautical industry as in every other industry competition strenuously demands it

The accomplishment of high standards of efficiency makes Van Schaack dope a vitally important raw material. Not by mere chance did the Alexander Aircraft Company adopt it—experts well versed in aeronautical engineering subjected it to the most drastic tests and finally acknowledged its outstanding superiority.

In using Van Schaack dope the manufacturer is assured of uniform quality strictly adhered to—increased anchorage due to better penetration—ease of application—greatest possible durability—minimum, drying time—all accomplished by the use of pure ingredients in the proper proportions

Give us the opportunity to prove its definite advantages.

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PERRY-AUSTEN

Don't Crack	D	Good Take Up
Don't Peel	O	Good Fill
Don't Rot	P	Easy to Apply
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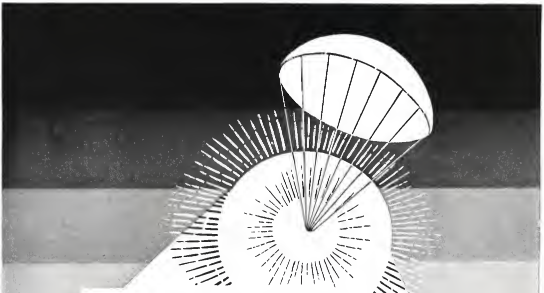

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